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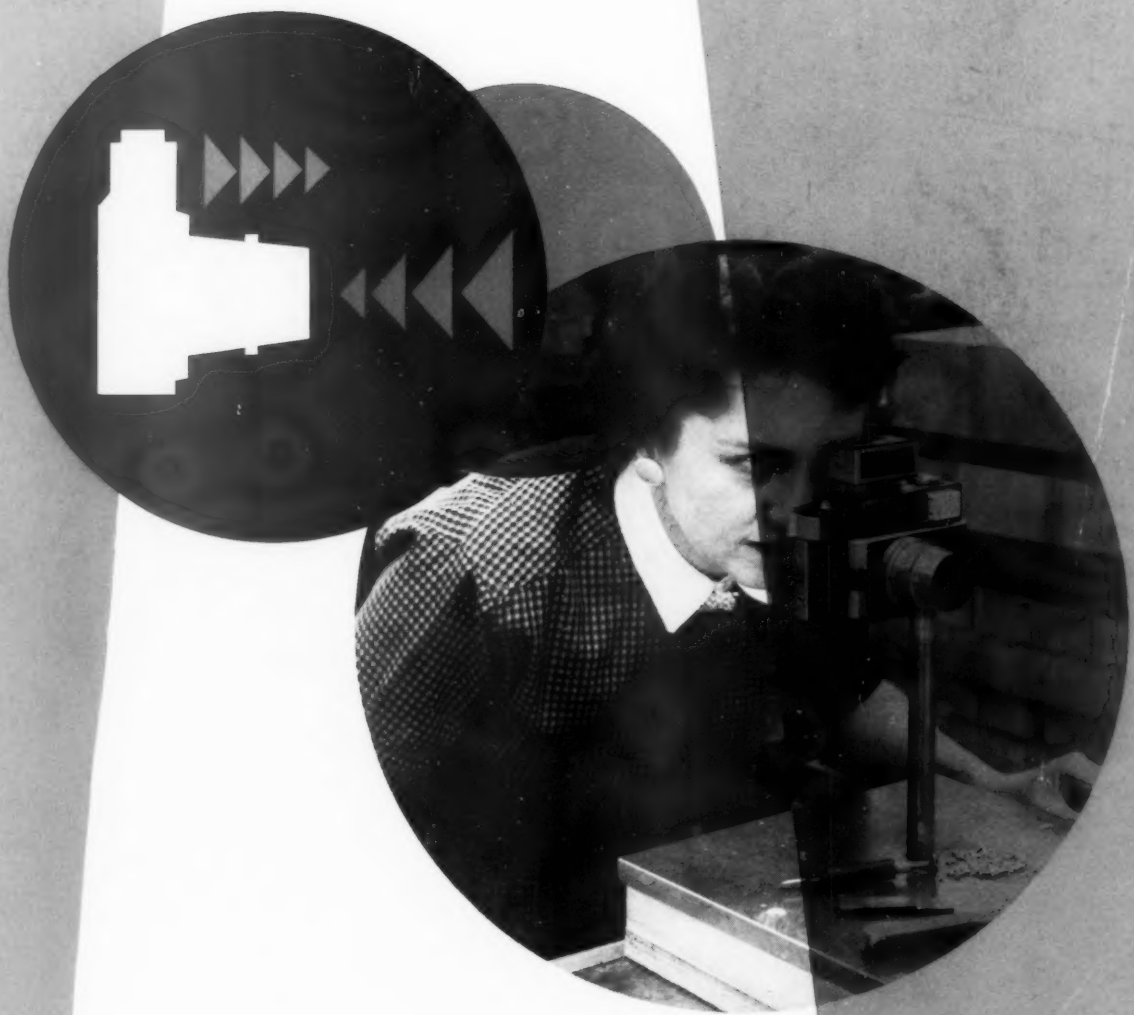

Quality Control: the Heart of Kodak Assembly

Also in this Issue:

Which Thread—Coarse or Fine?

Self-Broaching Bolt Used on Missile

Welding and Soldering Gas Tanks at Buick

FEBRUARY • 1960

and here's how Pheoll solved it

The farthest thing from this man's mind at the moment . . . is fasteners.

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assembly & fastener ENGINEERING

February, 1960 Volume 3, Number 2

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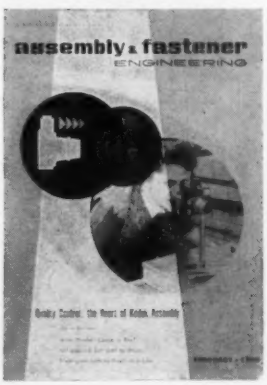
• To assure that their cameras have a precision-like operation, Eastman Kodak subjects all assemblies to rigid tests. For the story of Kodak precision assembly and 100 per cent inspection turn to page 24.



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ALLEN

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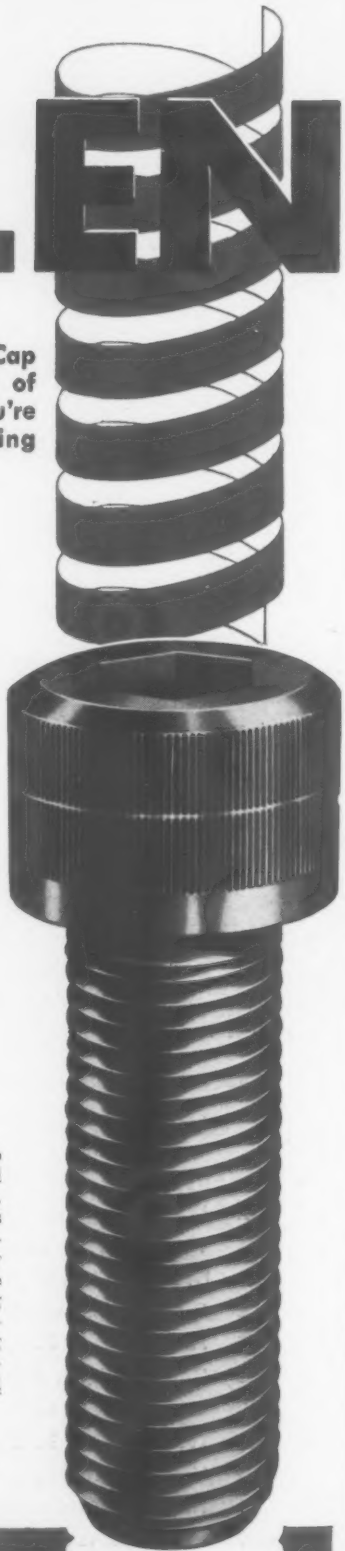

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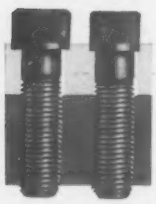
Allen's new 1960 Series Socket Head Cap Screws give up to 2½ times more load carrying capacity, without indentation. Head diameter of sizes from ¼" up is now uniformly 1½ times the body diameter—providing more under-the-head bearing surface, and a proportionate increase in clamping force. Write for new Bulletin G-25, with full specifications.



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Letters to the Editor

Managerial Rigor Mortis

Your November issue presented an editorial entitled "Beware of Managerial Rigor Mortis."

We feel that this would serve a very useful purpose in our department. Therefore, we are requesting permission to reprint it for internal distribution.

Marshall H. Terpening
Education and Training
Radio Receiver Department
General Electric Company
Utica, New York

Wants Fastener Clearing House

I should like to see a section in your magazine devoted to specific wants in fasteners.

This could act as a clearing house for manufacturers capable of supplying these needs, rather than the near impossible task of trying to guess who may be able to do this work, from various listings.

A. Bolin
Purchasing Agent
Crown Iron Works Company
Minneapolis, Minnesota

Christmas Message

The cover and cover editorial of your December issue deserve the highest compliments. I have always found your magazine interesting and informative, but the impact of this Christmas issue goes far beyond technical satisfaction. Thanks for one of the most refreshing things I have seen in a long time.

R. K. Hathaway
Chief Filter Engineer
Walker Manufacturing Co.
Racine, Wisconsin

The "Still No Substitute—" cover caught this reader's attention out of the hundreds of industrial publications that flow through our organization each month. Your cover editorial is just right.

I have resisted attacks on the commercialism of Christmas, because it seems that our objective is not to put a good thing out, but to bring it into proper prospective. I am sure that your readers and advertisers will feel that kind of an impact from your effort.

Harvey F. Swenson
President
Sweden Freezer Mfg. Co.
Seattle, Washington

Photo courtesy Ark-Les-Switch Corp., Watertown, Mass.

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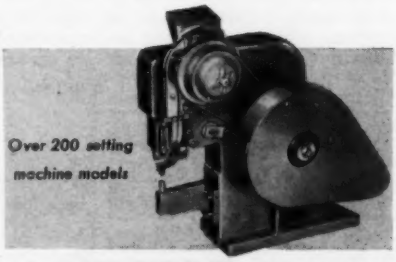
Your local Thomson Fastening Man, listed in the Yellow Pages, can help you select the right rivet-and-machine combination. Thomson's new handbook is another valuable source of up-to-date information. For your copy of "Cost-Cutting Facts About Fastening With Rivets", address your letter to Dept. 229.

Over 8000 rivet specifications



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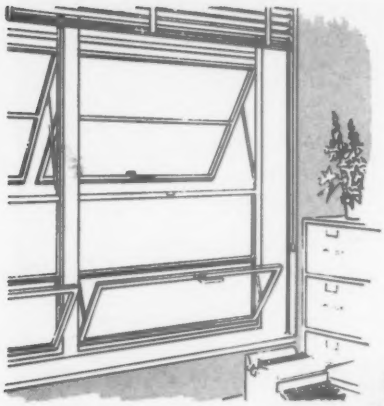

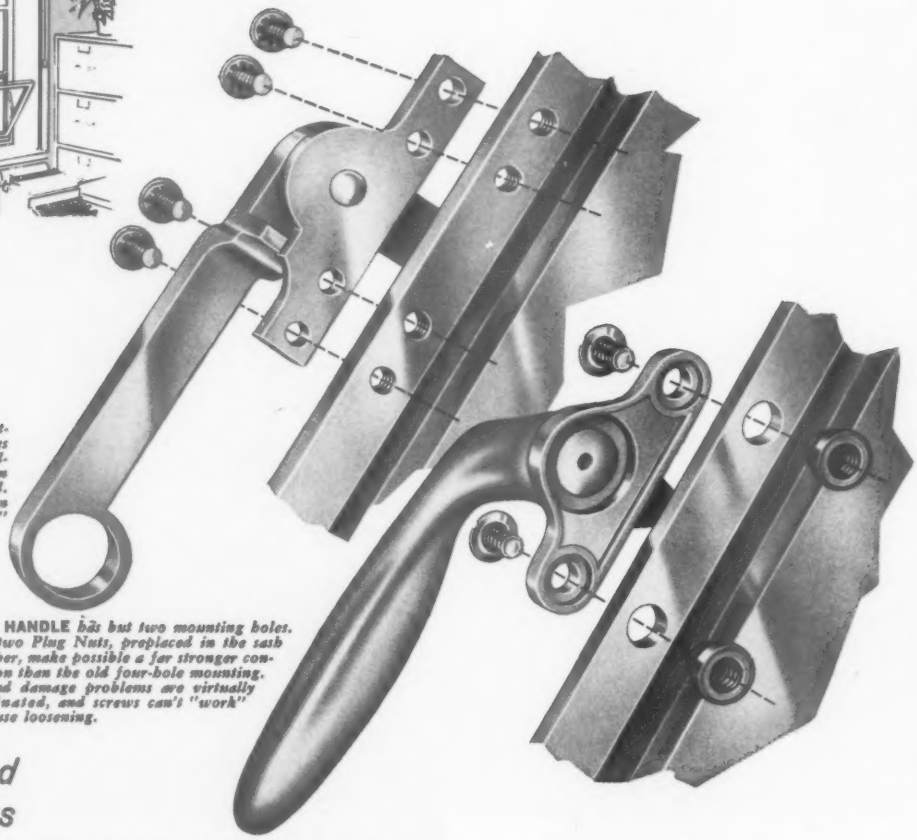

OLD HANDLE *required four mounting holes—and four tapped holes in the sash member. During installation, tapped holes were often damaged and had to be retapped. Handles frequently loosened in service because the screws "worked" in the holes.*

NEW HANDLE *has but two mounting holes. Just two Plug Nuts, preplaced in the sash member, make possible a far stronger connection than the old four-hole mounting. Thread damage problems are virtually eliminated, and screws can't "work" to cause loosening.*

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Plug Nuts cut installation costs... permit improved handle design

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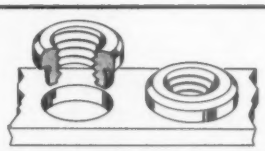
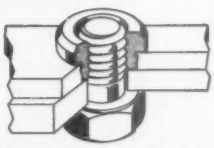
Plug Nuts are hardened, threaded inserts designed to be pressed into ductile material. Once inserted, the Plug Nut becomes a self-clinching, pre-placed nut—improving fastenability of thin or soft materials, such as steel, brass and aluminum. Plug Nuts are ideal for blind or hard-to-reach locations, and do not affect flatness of product material.

Plug Nuts are made for use in any thickness of material down to .030" and in any tap size from #4 to ¾". You can order Plug Nuts in case hardened steel, brass, various grades of stainless and aluminum in a full range of finishes. *Write for samples and complete application data.* Call your Lamson Distributor for immediate service on standard fasteners.

Distributors: Franchises for the sale of Plug Nuts are available in selected territories.



Plug Nut is easily inserted with hand punch or small press. Displaced hole material flows into knurls and annular groove, to clinch nut securely in place. Note that Plug Nut does not project through material.



Plug Nut's low profile head is a real advantage where clearance is tight.

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FEBRUARY, 1960, VOL. 3, NO. 2

QUALITY PRODUCT . . ON SCHEDULE . . REASONABLE COST

How would you like to consistently turn out a quality product, on schedule, and at a reasonable cost? This sounds anomalous in this day, but it happens to be part of the manufacturing philosophy of Rocketdyne, a pioneer in the rocket engine field.

In a visit to their headquarters in Canoga Park, California, we had the opportunity to discuss this philosophy with Ross Clark, plant manager.

Because we think this can be part of a workable philosophy for any company, we will pass on some of the thinking behind it. Should you think right off that it's not for you because you face different problems in your industry, then consider the problem common to the complete missile manufacturing field.

In the words of Mr. Clark, here is the problem: "Everyone in this work is faced with increasing reliability requirements, decreasing lead times, and a tightening rein on costs. The whole matter is complicated by a growing demand on components as rocket engines perform at higher specific thrust values with less weight."

The average company would probably not tackle such a dilemma head-on. But in the missile industry, a company like Rocketdyne has no choice but to resolve this dilemma, and in their own way as there is little backlog of know-how.

We have space to cite only one of their new manufacturing techniques, but one which touches every phase of their operations.

Briefly, this is it: When a new product is brought to Canoga Park, they get their most skilled production personnel together at once. This includes methods engineers, value analysts, tool designers, foremen, inspectors, etc. Their job is to decide the best way to make a new rocket engine.

"Once this group has reached a decision," says Mr. Clark, "we develop as soon as possible a packaged component in which all the necessary equipment and machinery are placed together so that the parts and personnel can be controlled in relation to each other. Concurrent planning and tooling parallel the design as it progresses, so that all parts, components and systems have the maximum opportunity for early testing if required, thereby increasing reliability."

What a difference from those companies which rush a product to market without taking the time to get all the bugs out, or who turn out a make-shift product to pacify internal factions with conflicting views, or who sacrifice a little reliability to save a few dollars.

And for those who feel they would gladly adopt Rocketdyne's philosophy if only they had plenty of government money to spend, we will close with this comment from Mr. Clark: "In the rocket engine field, cost-plus is a thing of the past; we can now deliver engines on a fixed-price base."

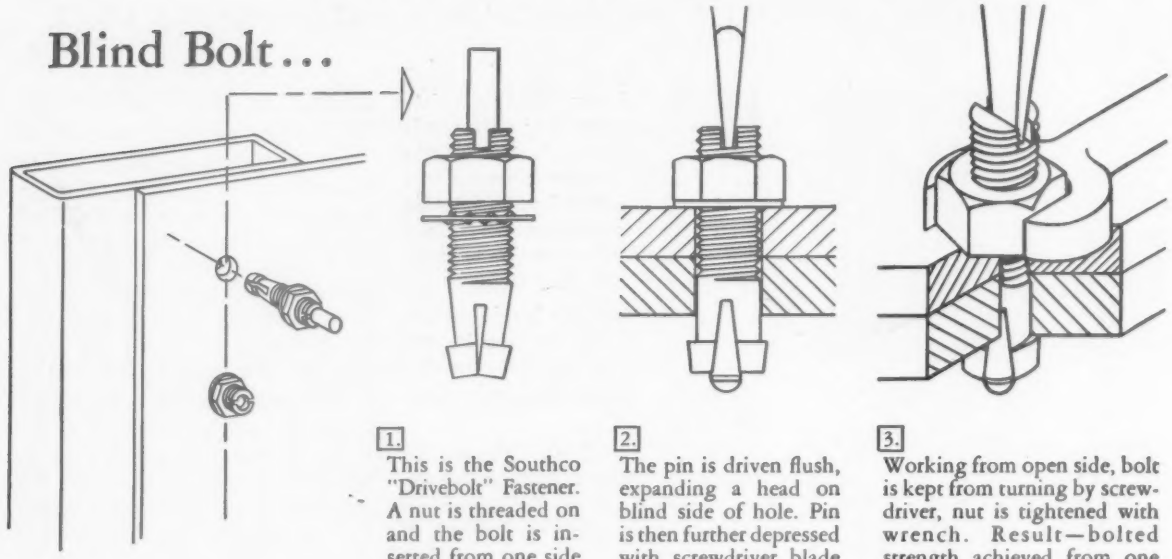
Matt E. Hewitt

Managing Editor

Simplified Bolting and Riveting in Blind Applications

For fastener applications accessible only from one side of the work, you can now bolt or rivet without special tools . . .

Blind Bolt . . .

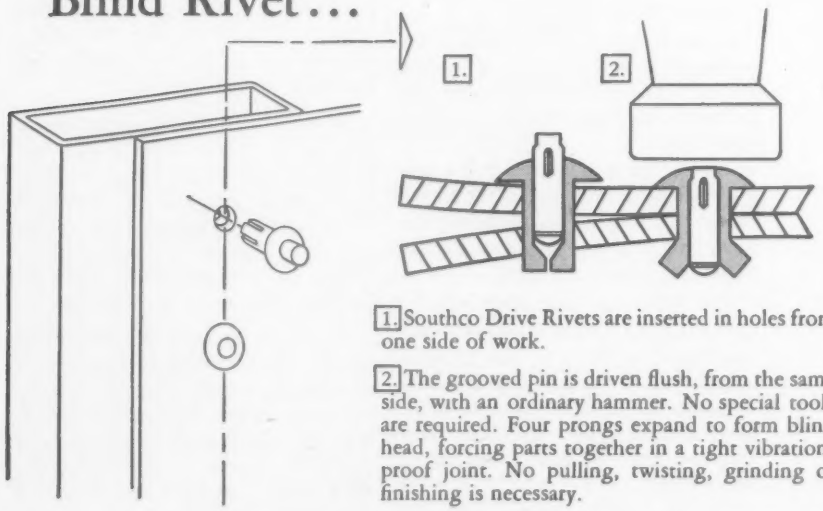


1. This is the Southco "Drivebolt" Fastener. A nut is threaded on and the bolt is inserted from one side of the work.

2. The pin is driven flush, expanding a head on blind side of hole. Pin is then further depressed with screwdriver blade to clear slot.

3. Working from open side, bolt is kept from turning by screwdriver, nut is tightened with wrench. Result—bolted strength achieved from one side of job

Blind Rivet . . .



1. Southco Drive Rivets are inserted in holes from one side of work.

2. The grooved pin is driven flush, from the same side, with an ordinary hammer. No special tools are required. Four prongs expand to form blind head, forcing parts together in a tight vibration-proof joint. No pulling, twisting, grinding or finishing is necessary.

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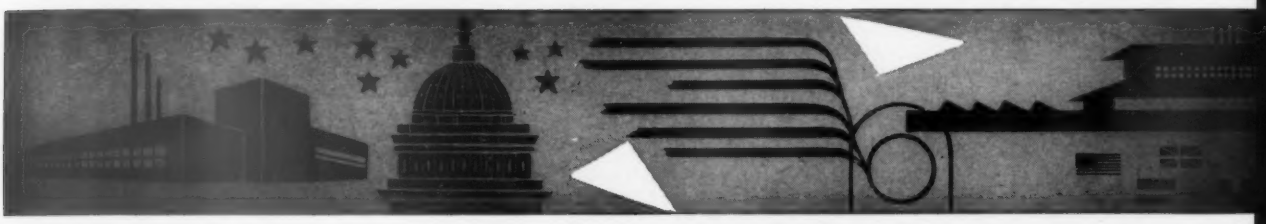
The State of Business



RAILS HIT THE COMEBACK TRAIL!

by **James N. Sites**

If labor difficulties in railroading as well as in the other major industries can be resolved without substantial work stoppages in 1960, railroads look forward to an increase in freight traffic of 8 to 10 per cent over 1959. This compares favorably with the 5 to 6 per cent pickup in general economic activity predicted for the nation as a whole. The rail figure is based on the assumption that a good deal of inventory rebuilding will be necessary throughout industry.

Forecasts of the long-range future of the railroad industry also call for a growth in freight traffic volume roughly paralleling that of total economic growth. If railroads maintain their present share of 45 per cent of available freight traffic, freight traffic could reach a level in 10 years of 817 billion ton-miles—40 per cent greater than the 1959 level.

This possibility is based in part on both an estimate by the Census Bureau that U. S. population by 1970 may reach an upper level of 219 million, and a forecast by economists of Gross National Product growth to a high of $645 billion by 1970.

Growth of rail passenger traffic paralleling that of freight is not presently foreseeable, though, expansion in some areas is forecast. This could be dramatically altered, however, through increased recognition by public authorities of the need for adequate high-volume rail transportation service. Major cities especially are starting to turn back to rail lines as their principal hope of averting urban strangulation in long-range planning.

JAMES N. SITES

Manager, News Service
Assoc. of American Railroads

James Sites has covered the Nation's Capitol for five years, first as an associate editor of the Whaley-Eaton Newsletter, since 1958 for the railroads. He previously reported for McGraw-Hill and Chrysler.

"Piggyback" service—hauling of truck trailers on flat cars—presents a particularly bright spot in the railroad picture. Piggyback loadings today are more than four times what they were five years ago, and the prediction has been made that this type of traffic may one day account for a full third of total freight carloadings.

If railroad traffic in 1960 turns out to be slightly above the 1957 level as presently predicted, a car supply problem could develop. Repair and purchasing program are once more picking up, however, and it is expected that more intensive car utilization will forestall general shortage.

CARLOADING BY COMMODITIES

	1959	1958	Pct.
Miscellaneous	16,278,810	15,239,515	+ 6.8
Coal	5,431,679	5,521,899	— 1.6
Coke	409,882	341,846	+19.6
Ore	1,655,316	1,754,551	— 5.7
Forest products	2,049,274	1,855,733	+10.4
Merchandise LCL	2,114,550	2,331,653	— 9.3
Grain & gr. products	2,750,901	2,873,350	— 4.3
Livestock	300,226	307,663	— 2.4
Totals	30,990,638	30,226,210	+ 2.5

Looking back on 1959, the railroads saw an initially promising year abruptly cut down to 1958's depressed proportions by the 116-day steel strike Despite a marked traffic upturn in the first six months, carloadings for the full year averaged only about 2½ per cent above 1958—and 13 per cent below the more normal 1957.

The steel strike resulted in a direct loss of about 2½ million carloads of freight and more than $600 million in rail revenues—this loss equalling the industry's final total net income. Resulting return on net investment in 1959 was only 2.8 per cent—about the same as in 1958 and well below the post-war average of 3½ per cent. This earnings rate significantly is only about half that considered normal for other regulated business, and is but one third of that in general manufacturing.

Another factor contributing heavily to reduced railroad earnings in recent years has been the $550 million annual loss resulting from make-work practices—commonly called featherbedding—among

continued

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2 HARDENED Case hardened to 60-62 Rockwell "C" scale.

3 SIZES 132 standard, 3/8" to 6" lengths, 1/8" to 1" diameters. Special on request.

4 SAFETY Breaks before bending or mushrooming, no misalignments or major damage.

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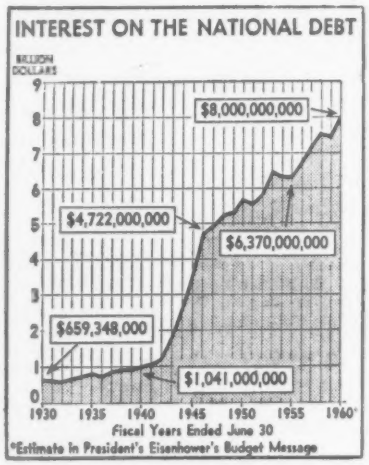
train operating crafts. In addition to earlier wage proposals, railroad management on November 2 presented to rail labor leaders six specific proposals aimed at overhauling the outmoded pay and work rule structure.

These proposals in brief, call for revision of the 40-year-old pay standard for train crews to reflect increased speeds; elimination of rules preventing crews from operating through present crew-change points; abolishment of arbitrary jurisdictional lines now drawn between road and yard crew work; giving management the right to determine when firemen should be used on freight and yard diesels and when and where trainmen, conductors, engineers and others should be used in train service and on self-propelled work equipment.



The question of modernizing the outmoded work rules that give rise to featherbedding practices is a major issue in negotiations between the railroads and the operating unions as it has been during the steel talks now in progress. Yet despite its importance, featherbedding is only one of several major problems facing the railroads as they enter the decade of the sixties. Public policy problems of discriminatory regulation, oppressive taxation and spiraling competitive pressures from tax-built and tax-free airports, highways and inland waterways are among others of equally serious impact.

Given effective action on these fronts, it is possible that railroads will not only retain their present share of growing business but also regain considerable ground in the years ahead. Railroadmen believe that railroads are inherently the most economical form of transportation yet devised. •

Industry Notes

Railroads will spend $1 billion for equipment this year, plan to recoup some of 66% share of freight market they held in 1946. (Now have 45%) . . . The Brotherhood of Locomotive Firemen and Enginemen warn that management's intention to eliminate 350,000 jobs represents "a threat to national security" . . . RCA's David Sarnoff forecasts electronics industry sales of $16 billion in 1959, $25 billion in 1965, up from $14 billion in 1959 . . . Employment this summer should top July 1959 record of 67.5 million . . . Congress is expected to raise minimum wage to $1.25 . . . Ninty-four Senate Rackets Committee investigators are now on the payroll of Daniel O'Connor's Federal agency policing the new labor law . . . Aluminum producers raised prices of 1.3 cents a pound but claim no tie-in to wage hikes. Just restoring pre-April 1958 levels . . . The take-home pay of the typical factory worker climbed 3.5% in 1959 . . . A group of 38 U.S. companies known as Intertex International sold $21.4 million worth of textile machinery to Russia—first major U.S. private sale to USSR since World War II . . . Some 90 jet and turboprop aircraft will begin competing in April on lines operating to and within Europe . . . J. L. Block of Inland Steel looks for an industry operating rate of 87% of capacity this year, producing 130 million ingot tons. This compares with 117 million tons in 1955, 85 in 1958 and 92 in 1959 . . . Dow Chemical will market a new auto coolant replacing both water and anti-freeze, good for 12 months, costing $8-12 a car. •

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In only three seconds you make a solderless, metal-to-metal electrical connection that's lastingly secure . . . one that conquers vibration failure and fights corrosion.

And it's all so easy and inexpensive with a lightweight, fast-acting Gardner-Denver "Wire-Wrap"® tool. Even an inexperienced operator becomes an expert in no time. But see for yourself . . . look at these profit-building benefits:

Greater production. Only three seconds total time per solderless connection. Actual connecting time, $\frac{1}{10}$ second.

Lower production costs. You eliminate the expense of precise process control required by other methods.

Reduced labor costs. More connections per operator, with less fatigue. No faulty connections that require expensive hand repair work.

Higher quality. Mechanically strong connections electrically stable—proved most reliable in the industry.

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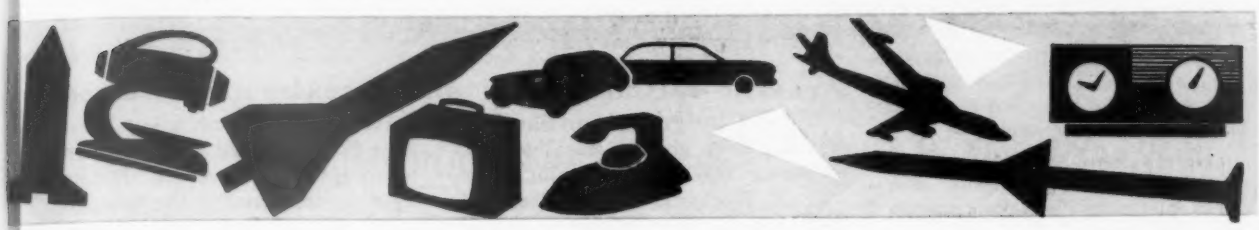
Industry at Work



VALIANT'S GATE-LINE ASSEMBLY BRINGS PARTS TOGETHER FOR WELDING

An efficient way of automobile body assembly, based on Chrysler Corporation's gate-line assembly method, is used by the company to mold the unit body of its new compact car, the Valiant.

In the gate-line adaptation engineered for Valiant the entire body from start to finish—from the floor to the fenders—comes together and is welded on a continuous moving gate-line system.

"Each and every section fits like a glove," Fred M. Glassford, group executive for Chrysler's Car and Truck Assembly Group, said in describing the Valiant body assembly.

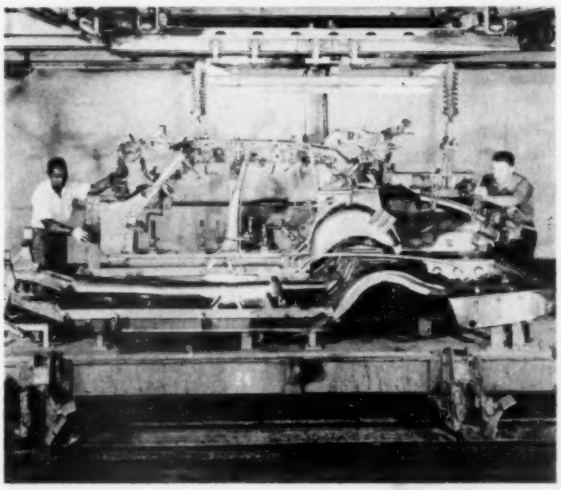
The gate-line for Valiant holds all the basic parts. The front and rear floor pans are assembled first on what is known as the gateline base. This travels along a track on the floor. The sides of the Valiant are assembled in the gate itself—the left side assembled in the left gate and the right side assembled in the right gate. Each gate contains the cowl, side, roof rail, wheelhousing, quarter panel and sill assemblies. The two gates travel from the sides and are locked to the moving base. The various body parts they hold in place are fitted like a key to a lock and welded.

The base—traveling like a railway flat car—continues along the assembly line with the gates attached on either side as welders work inside and outside unitizing the various parts. Joining the unit at this stage is the dash cowl, top assembly, windshield header, rear window header and upper deck and panel assembly.

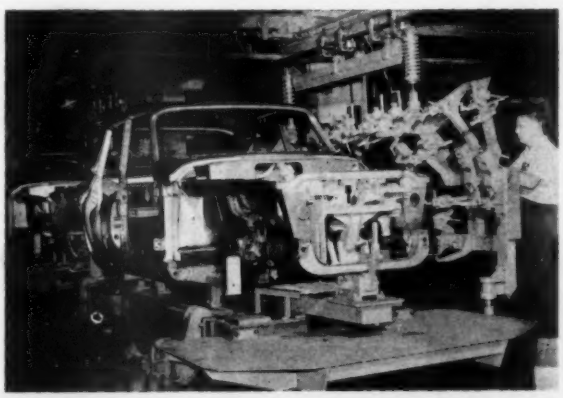
Next the shelf and the deck fit into place and showers of sparks mark the welding process. Reinforcement assemblies, the tail panel and the roof are then integrated into the unit body as the gateline continues along its route.

Next, the gates on either side are removed and they travel to another floor area to be fitted once again with the side parts of the Valiant. The base continues, and the side shields and front fenders are fitted. Then the job of spot welding, arc and gas welding is completed on the unit body. The car proceeds—still on the base carriage—to the wire brushing stage and the soldering and grinding. After

continued



In the gate-line method of final assembly, the entire car is assembled on a moving track. Two gates bring the many parts of the car together in a perfect fit. The right hand gate is shown above moving toward the floor pan with all the essential right side parts ready for welding.



Complete Valiant Unibody leaves its gate assembly fixtures behind at this point in the assembly line. The right side gate has rolled away and is out of sight to the left and a foreman is seen unlocking the left side gate—minus its integral car parts.

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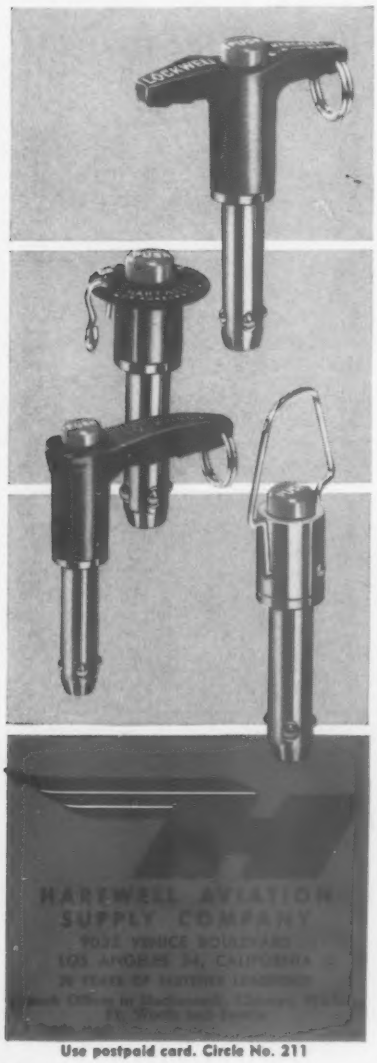
GREATER SAFETY – Exclusive 4-ball locking element – Oversize *RED* release button – Fail-Safe design allows pin to operate if handle is broken.

ADVANCE DESIGN – Gripwell handles for maximum operation – Steel shoulder bearing provides best resistance to wear – Black and red functional finish.

SPECIAL DESIGNS – In addition to standard configurations, Lockwell features can be incorporated into pins to meet special design requirements. Your inquiry is sincerely invited.



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this the hood, front fenders, doors and deck lids are fitted and the unit body is removed from the base to the metal finishing line.

The gate-line system is enhanced by new heavy duty welding—heavier guns with amperage raised to 75 and 150 kilovolt amperes while previous methods used only 50 kva's. Higher quality welds are assured with this higher amperage and increased pressure.

PLASTIC BALLOONS BOOST WINTER CONSTRUCTION SEASON

Giant polyethylene-film balloons have given a new boost to winter season construction, says T. E. Werkema of Dow Chemical Company. The balloon is spread over the building site and supported with air from a low pressure fan. Materials and workmen are kept from freezing. Ample light comes through the translucent plastic, from which semi-permanent structures are made.

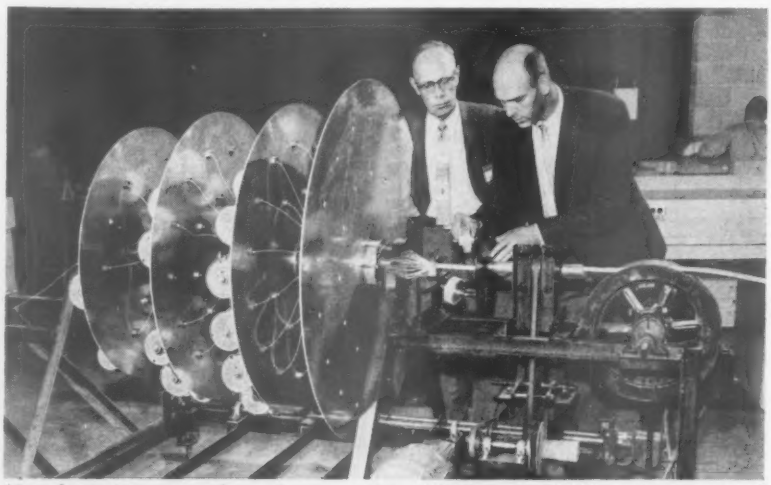
BOEING DEVELOPS FLEXIBLE CABLE WINDER FOR BOMARC

A Boeing-developed cable winding machine is producing flexible electric cables for Bomarc ground-launching equipment at a significant saving in time and cost over handwinding or outside purchase. The machine was designed, built and in production in just 30 days.

The interesting aspect, outside of the time and cost savings, is that only a half dozen or so manufacturers in the nation, all using machines of their own design, possess the highly specialized capability of mechanically combining several score wires into a single, compact electrical connecting unit that can be snaked along the ground with the ease and celerity of a vacuum cleaner cord.

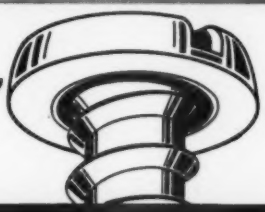
The Boeing machine consists of four aluminum discs, each of which carries its complement of gimbaled wire spools. The discs are mounted on varying sizes of steel tubing and driven in opposite directions by geared line shafts through chains and sprockets. Threading of the machine is facilitated by quarter-inch tubes running from each wire-spool disc to the front of the machine. Proper lay of the cable is made by a 14″ diameter pulley at the front of the machine, which pulls the cable forward at the proper speed ratio to the rotating discs.

The machine manipulates up to 84 strands of wire in a complex contra-helical layer—each layer spiraled in the opposite direction to its neighboring layer beneath —to produce cable automatically taped as it emerges from the forming die. Four-layer cables of No. 16 AWG or smaller wire can be formed to a diameter of 1¼″ at about 15 ft. a minute. •



Manufacturing research engineers C. W. Wildebour and W. L. Dumar Jr. of Boeing's Aero-Space Division developed this cable winder.

Take P-K . . . the original tapping screw . . . Add

the new "threaded into the head"  Hi-Thred® feature,

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new, convenient 1,000-piece carton

AND YOU'VE GOT THE NEW P-K® GRAND-PAK

Best fastener buy on the market! Next time you order, ask for the P-K GRAND-PAK . . . it's a smart buy. You get Parker-Kalon quality—the original tapping screw. You get the exclusive Hi-Thred feature developed by Parker-Kalon. And you get a quantity that meets your every-day requirements—big jobs as well as small. Every one of the thousand P-K fasteners in a GRAND-PAK is a genuine P-K Hi-Thred . . . the last thread actually terminating in an annular orifice in the head itself. They grip like a bulldog, even in thin gage sheets . . . and *you get this extra feature at no increase in price!*

The GRAND-PAK is factory sealed, carries the Parker-Kalon guarantee, and is *in stock* at your local P-K Industrial Distributor's warehouse ready for immediate delivery. Available cadmium plated in a wide variety of sizes in Pan Head, Type "A".

Also available through your local distributor—P-K Tapping Screws, Types A, B, F and U in a complete range of sizes and head styles in Hardened Steel, Stainless Steel, Brass and Aluminum. Call him today for your requirements.

PARKER-KALON® *Tapping Screws*

PARKER-KALON, a division of General American Transportation Corporation, Clifton, New Jersey. Offices and warehouses in Chicago and Los Angeles.

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Courtesy Davey Compressor Company, Kent, Ohio

Saves 65% of screwdriving time with...

NEW ROTOR J-20S IMPACT WRENCH

JOB: Driving hex nuts and slotted screws attaching covers to portable compressors. Formerly used universal electric tools. Took 20 minutes per cover.

RESULTS: New Rotor J-20S Air-Powered Impact Wrench, with quick-change chuck and combination bit and finder, drives ¼"-20 slotted head screws to attach covers in 7 minutes. Saves 13 minutes per cover. Assures uniform tightness. Reduces operator fatigue.

Ask for a demonstration of the J-20S or other Rotor air tools on *your* job to see how they cut your costs. Write for quotation and literature on the J-20S Impact Wrench.

ROTOR AIR TOOLS: Assembly Tools • Drills • Small Wheel Grinders Straight Grinders • Vertical Grinders • Scalers • Chippers • Rammers Special Tools • Air Motors

ROTOR HIGH-CYCLE ELECTRIC TOOLS: Grinders • Polishers • Sanders

ROTOR TOOLS

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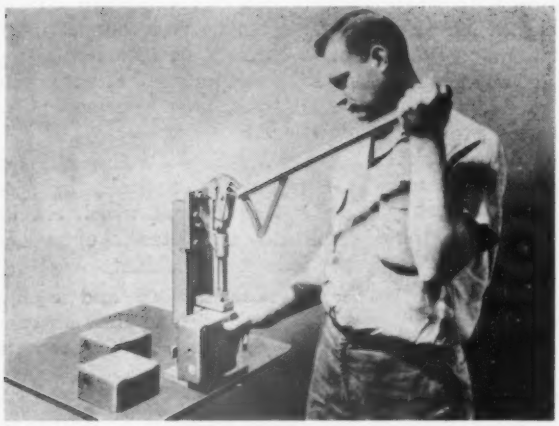
Assembly and Fastening Ideas



In punching two mounting holes of either 9/32" or 13/32" diameter, the model 650 clamp has a rated holding pressure of 4000 lbs. Calculated force generated in piercing the 16-gauge steel exceeds 5000 lbs.

"PRESS" SETUP CUTS HOLE PIERCING TIME

Trying to cut electrical relay case manufacturing costs, Roy W. Woodward, shop superintendent at B/W Controller Corp., Birmingham, Mich., used standard sections of steel and a $19 plunger-type Detroit Stamping toggle clamp for surprising savings.

Woodward built a simple hand "press" that eliminated drilling and de-burring operations for making mounting holes in relay cases. Job time per 100 cases was reduced from over eight hours to between 45 minutes and one hour. The old method also produced undesirable scrap by chipping the protective coating.

A handle extension and support braces are welded to the toggle clamp handle and mounted on a steel block supported by short columns. The punch is screwed on the plunger and the die button is in a locator block that also serves as a platen to support the case when the hole is being pierced.

The unit can be bolted or clamped to a portable table or bench.

UNIT AUTOMATICALLY INSPECTS AUTO STUDS

An automatic inspection and segregating machine checks the presence of a cotterpin hole and a screwdriver slot in a plain or threaded stud, at the rate of 2500 pieces per hour, ejecting those without holes and slots immediately after inspection.

A typical part piece, shown in the sketch, is a stud, front suspension—upper arm ball joint and lower arm ball joint.

The Instruments and Systems Division of The Sheffield Corporation, a subsidiary of Bendix Aviation, designed and built the machine for a major automobile manufacturer.

Four different size studs are checked on the machine through the use of interchangeable tooling. Studs are gravity fed into the machine along slide rails, entering the checking station singly, slot end

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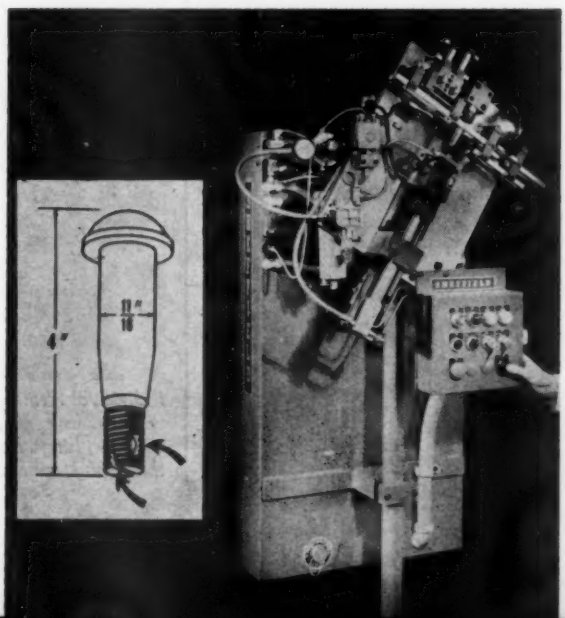

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down. The bottom half of the stud seats into a receiver ring where controlled airflow detects the presence or absence of the hole, and an Airlectric control unit converts the pneumatic impulse into electrical signals to actuate a stamping device if the part is acceptable, or to reject one which is unacceptable.

Screwdriver slot presence is checked with a probe operating against a microswitch. This type of "detecting" station is now being used in many automation transfer machines.

TWO-STAGE WIRING ASSEMBLY REDUCES FATIQUE, ERRORS

A simple production technique has been developed to simplify the wiring of large terminal bays used in computers.

One of the most difficult processes to simplify in electronic production has been wiring itself. The necessity for proper positioning of what may literally be thousands of separate leads has defied any attempts at automation, or even use of simple mechanical aids for the assembler.

A two-phase assembly program was devised at Librascope, Inc., Glendale, Calif. Rather than requiring a wirer to stand at a cabinet and wire the entire bay, the connectors have been grouped in three panels, which are individually wired at benches where the worker may sit and work under optimum lighting conditions. At the completion of wiring, the separate units are bolted into the cabinet to form one large bay, and inter-connections between the separate panels are quickly completed.

The two-stage assembly permits a greater number of wirers to work on the terminal bays. It reduces fatigue and errors during the placement and connection of the thousands of insulated wires which must follow a direct point-to-point path from one terminal to another.

At completion of wiring, all bays are tested automatically by specialized equipment which checks continuity and potential of all connections in the cabinet.

These techniques and equipment have cut lead time on contracts by as much as 25%, reports Lewis W. Imm, president.

continued

Individual terminal sections for data processing equipment are wired at benches where workers may sit and work under optimum lighting conditions. By dividing large bays into sections, fatigue and errors are reduced during placement and connections of the thousands of insulated wires.

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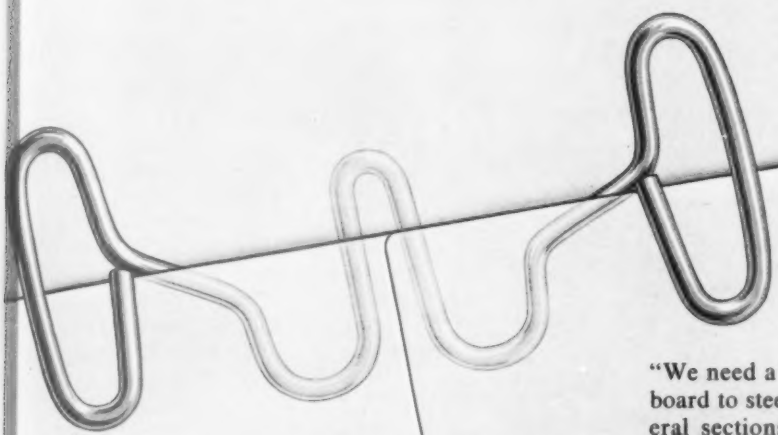
KEYSTONE WIRE... DUDEK & BOCK

turn an idea into a reality



"We need a clip that will securely fasten gypsum board to steel upright studs—or join and hold several sections of board in perfect alignment for plastering. Here's what it must look like."

This is the challenge. Designers at Dudek & Bock, Chicago, Illinois, roll up their shirt sleeves. They analyze wire requirements: tensile, uniformity. Length of run—a long one. Delivery—soon.

What wire fits these requirements? Keystone Silver Brite Galvanized high tensile wire is first choice. They know from experience they can depend on Keystone wire to perform exactly as calculated—order after order—run after run. By standardizing on Keystone wire for the majority of their needs, Dudek & Bock simplify quality control and manufacturing problems. They regularly use a wide selection of Keystone wire to meet their forming and spring requirements—this includes low and high carbon wire, brite and galvanized.

Result: Another fastener problem solved with wire . . . delivery on schedule of this gypsum board clip and thousands of other items . . . and maximum customer satisfaction.

Perhaps creative imagination and Keystone wire can help you build your products faster, better, at lower cost. A Keystone cold heading or wire forming specialist is available to help you.

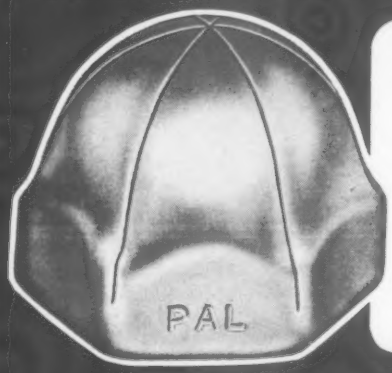
Keystone Steel & Wire Company, Peoria, Illinois

KEYSTONE

WIRE FOR INDUSTRY

Cover exposed ends of screws, rods, studs, wire with

ACORN PALNUT® FASTENERS



- Reduce assembly parts, operations, time and cost
- Provide vibration-proof assemblies
- Low in cost
- Protect against scratching
- Add pleasing appearance.

3 TYPES AVAILABLE to meet design needs

1 ACORNS that turn on screw threads

ACORN PALNUT LOCK NUTS

Attractive spring steel lock nuts apply fast with hand or power tools. Save weight and cost, stay tight in service. Full acorn and semi-acorn types. Many sizes and finishes, #6-32 thru ¾"-16.

2 ACORNS that push on plain rod

ACORN PUSHNUTS®

Simply push on unthreaded rod or wire for tight assemblies. Strong spring steel grip. Save threading, drilling, grooving, cotter pins. Closed and open end types. Sizes for .120" to .312" dia. rod in choice of finishes.

3 ACORNS that make their own threads

ACORN PALNUT SELF-THREADING NUTS

Save cost of threading. Make their own threads while tightening on plain rods, studs or wire. Fast assembly with standard tools. Vibration-proof. Removable and reusable. Sizes for ⅛" and ¼" dia.

WRITE for free samples and data. State type, size and application.

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LOCK NUTS and FASTENERS

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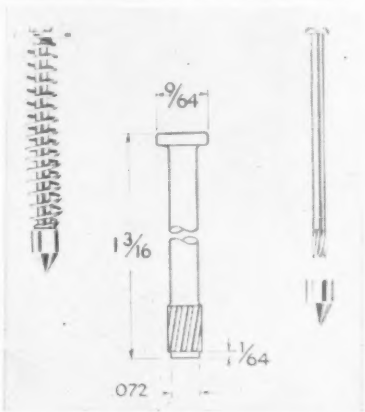
WAX TAP CARTRIDGES ELIMINATE CHIP PROBLEMS

The Tap Cartridge Company, Cincinnati, has developed a new-formula wax pellet that eliminates the many chip problems encountered in blind hole tapping operations.

Here's how it works. In the tapping operation, the wax pellet is dropped into the already drilled, or drilled and reamed hole. As the tap works its way into the hole, a solid flow of wax carries the chips along and out the flutes as fast as the chips are made. The last chips left at the bottom of the hole are embedded in that portion of the Tap Cartridge still in the flutes of the tap. Immobilized in this manner, they are withdrawn with the tap. The tap actually touches the bottom of the hole with no chip interference and there is no necessity to clean the tap between holes. Cartridges are available in sizes 0-80 through 1¼". They can be used equally well in steel, iron, aluminum, plastics, and the newer exotic metals.

SIMPLIFY PLUNGER BY REDESIGNING FOR HEADING



A large manufacturer of soap dispensing machines requested John Hassall, Inc. to redesign and manufacture a corrosion resistant liquid dispenser plunger. Requirements called for a low cost, simplified assembly to be built to very close tolerances.

Hassall redesigned the plunger from a machined part to a cold-headed knurled part. The result was a part with greater strength, smooth rounded corners without burrs and close dimensions.

ASSEMBLE TRACTOR CUTTER BARS TO RESIST STRESSES

Much of the ruggedness of modern tractor mowers depends on the cutter bar that extends out from the drive mechanism to support the reciprocating knife.

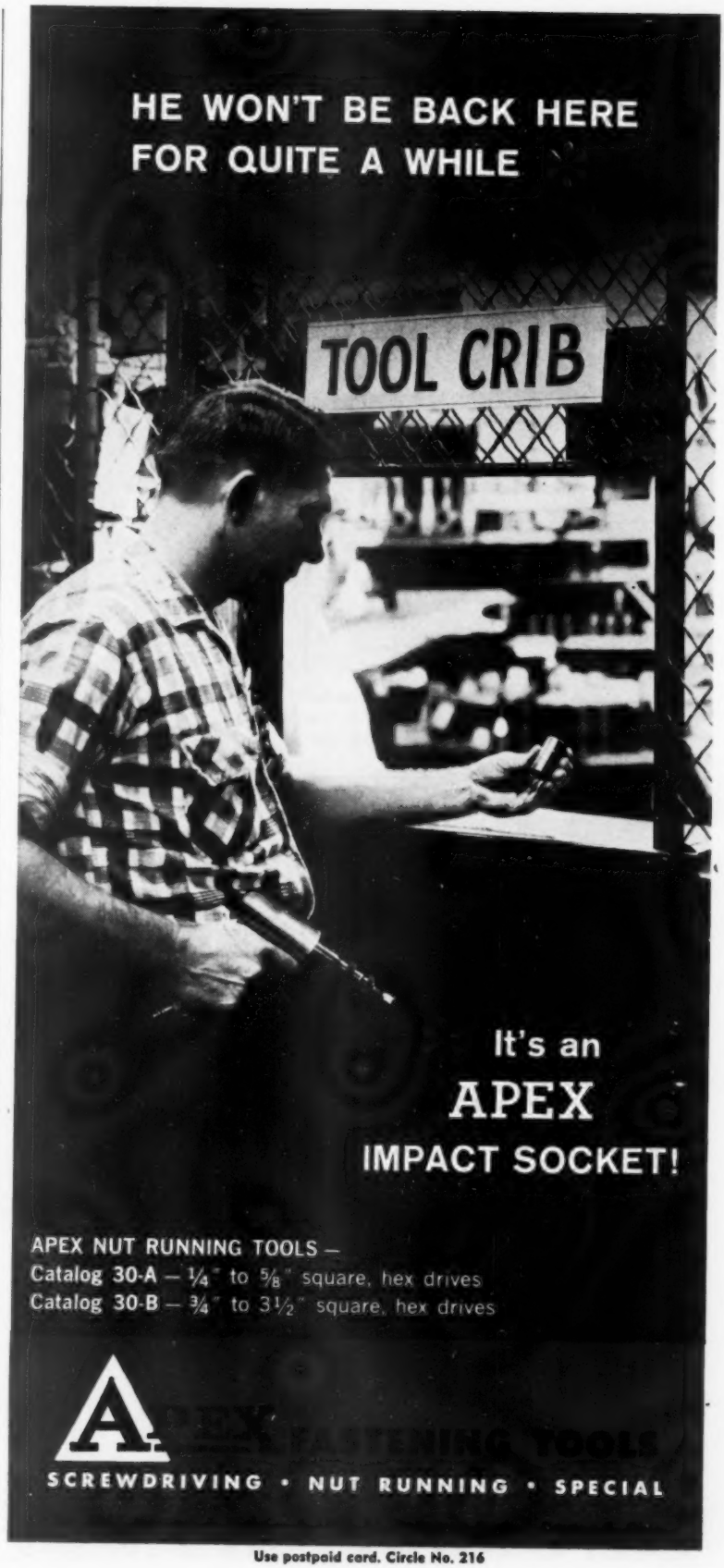
Assembly begins by bolting the cutter guards, wearing plates, holders and other parts.

In addition to withstanding vertical and horizontal bending stresses, this bar, five to nine feet long, must also resist fatigue stresses produced by vibration of the rapidly moving knife and by the constant jarring of travel over rough terrain.

The cold-rolled steel cutter bars made for Deere & Company by Jones & Laughlin Steel Corporation are fabricated and assembled to resist these operating stresses more efficiently.

Hold-down clips on the cutter bar are checked by sliding the knife along the bar.

When prefabricated bars are received at the Deere plant, as many as 40 bolt holes are drilled in the 7/16" section of each bar for cutter guards and other components. One of these is then reamed to a square shape. The only other machining operation is milling an edge at the inner end of the bar so it will fit into the inner shoe of the mower assembly. •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FOR QUITE A WHILE
TOOL CRIB
It's an
APEX
IMPACT SOCKET!
APEX NUT RUNNING TOOLS —
Catalog 30-A — ¼" to ⅝" square, hex drives
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SCREWDRIVING • NUT RUNNING • SPECIAL

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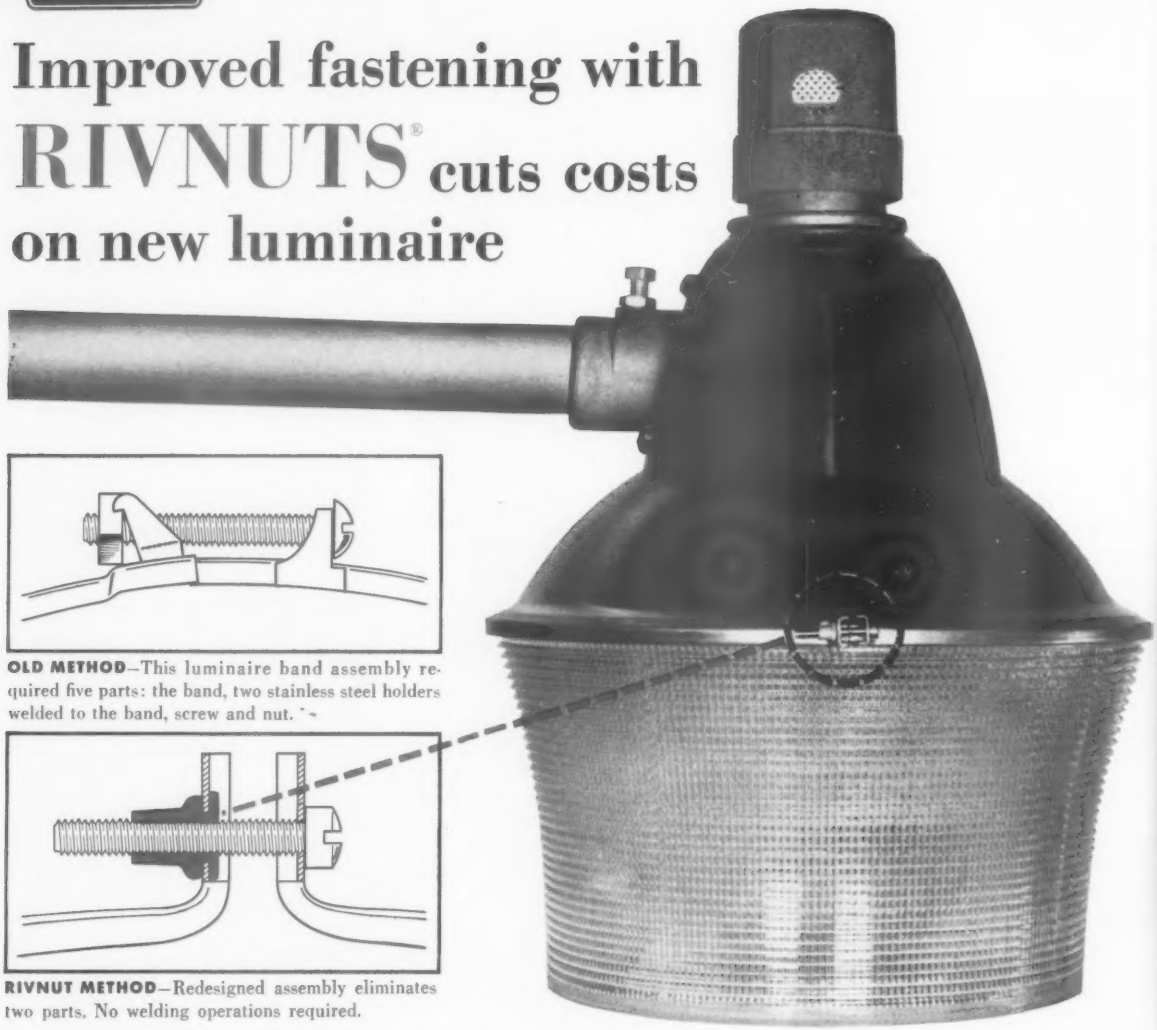
B.F.Goodrich

Improved fastening with RIVNUTS® cuts costs on new luminaire



OLD METHOD—This luminaire band assembly required five parts: the band, two stainless steel holders welded to the band, screw and nut.

RIVNUT METHOD—Redesigned assembly eliminates two parts. No welding operations required.

The manufacturer of this outdoor lighting luminaire, Line Material Industries, McGraw-Edison Company, reports "considerable cost savings" since redesigning the luminaire holding band for RIVNUT fastening.

Five separate spot welds were eliminated, along with two parts. The RIVNUT is strong and secure. And unlike the old method, there's no loose nut to be dropped.

RIVNUTS are the only one-piece blind rivets with internal threads. They can be installed by one person, from one side of the work, in a few seconds with a heading tool. If you'd like recommendations on a specific fastening problem, please send a print of your part.

You can improve fastening in sheet metal, tubing, tanks with RIVNUTS

New data booklet describes principle, typical applications of RIVNUTS, lists size and tool data. For free copy write Dept. AF-2, *B.F.Goodrich Aviation Products, a division of The B.F.Goodrich Company, Akron, Ohio.*

B.F.Goodrich *Rivnuts*

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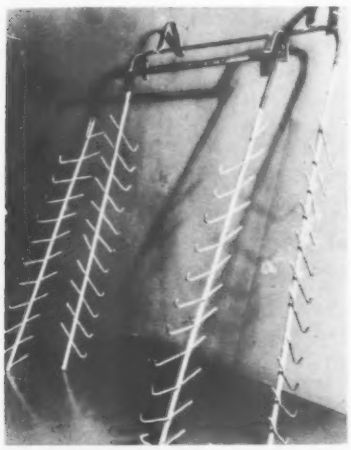
SILVER SOLDERING CUTS COSTS, LICKS ELECTROLYSIS IN FASTENING PLATING RACKS

A plating job shop tried a number of fastening methods before silver soldering solved its problem application.



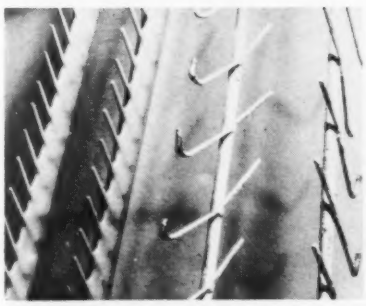
To join plating rack contact tips to splines, John Morris of Welders Supply Co., Seattle, chose a solder with a working temperature of 430°F and tensile strength of 28,000 psi.

North West Plating Co., Seattle, Wash., makes its own plating racks. These were soon weakened by electrolysis as acid found crevasses in the plastic coating and penetrated points where contact tips were bolted to spline or frame.

Brazing the tips to the spline was tried, but the heat annealed the copper contacts, with the result that they bent under load.

A conventional hard solder with minimum temperature requirement for application of 1130°F. was used next. Again, heat had an annealing effect on copper, and load caused contact tips to bend.

Eventually, temperature limits were determined. The solder could not melt at 365°F, the heat at which the poly-vinyl chloride plastic coating is baked on to the rack. On the other hand, the melting point could not be so high that soldering would cause the copper to anneal.



Plating racks before and after plastic coating is baked on.

All-State's high-strength, silver-bearing stainless solder and non-acid flux with a working temperature of 430°F met the requirements. The result was a saving of $300 in making a dozen racks, with hole drilling and hardware eliminated, fabrication time reduced 80%, a lighter finished product.

DEVICE ANCHORS THREADED INSERTS, ALLOWING MOUNTING HOLES TO PASS TORQUE TEST

With simple ingenuity, Grand Haven Plastics Company redesigned a molded part to meet a rigorous torque test for mounting holes.

The Grand Haven, Mich., firm was making a front-body casting for a welding transformer. Engineers had no choice but to solve a problem of failing threaded mounting holes or switch from Atlas Powder's glass-reinforced polyester molding compound to an aluminum die casting, less favorable for the application.

Metal inserts, even with serrated edges, were coming loose under stiff RWMA standards of 800 in.-lbs. of torque. The relatively large size of the threaded hole (½″) was blamed for this.

Grand Haven developed a simple anchoring device for the threaded inserts. Location of the four mounting holes in the rectangular casting—a pair per corner on one end of the part—allows each pair of inserts to be assembled into a unit.

A 90° steel anchoring device checked loosening inserts and saved this casting design.

With a steel strip (1/16″ x ½″) bent at a 90° angle serving as the joining element, an insert is welded on each side of the bend. The entire assembly is then molded into the corner of the front body casting. Thus the stress is distributed throughout the entire corner, and the inserts can withstand an average of over 950 in.-lb. of torque, well above the minimum requirements.

continued

NEW...

midget pliers added to KLEIN line

Hardly larger than a package of your favorite cigarettes, these new Klein Midget Pliers will simplify many of those small jobs where space is confined.

Midgets in size but giants in performance, they solve major problems when wiring up electronic assemblies; making model trains, airplanes, automobiles, or in any extremely small or confined work.

These new midgets are additions to the famous Klein line of high-quality pliers that are backed by over a century of manufacturing experience. See your dealer.

No. 257-4 Oblique Cutting Plier	**Size 4 in.**
321-4½ Long Nose Plier	**4½ in.**
322-4½ (Without Knurl)	**4½ in.**
224-4½ End Cutting Plier	**4½ in.**

Free Bulletin on Klein Pliers

Bulletin *758* lists the many various pliers in the Klein line. A copy is yours for the asking. Write for it today.

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Anchoring is increased by splitting and flanging the ends of the steel angles to produce increased bearing in the molded Thermaflow 100. By way of contrast, the same holes in an aluminum casting could withstand a maximum of 800 lb. of torque.

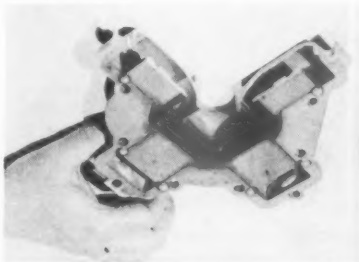
BONDED 3-PIECE PUMP CASTING REDUCES REJECTIONS TO ZERO

Difficult-to-make castings are now easily and economically produced by assembling simple cast sections with adhesive bonding techniques. A large pump manufacturer has reduced rejection rates to zero from a previous high of 25% in the manufacture of pump castings with this new assembly technique. In this application, three separate die castings are bonded to form one complicated pump assembly.

The adhesive used for this application is a one-part high-strength 3M adhesive with an epoxy resin base called EC-1386.

Previously the pump part was cast in one piece by the sand mold process. However, because of the complex interior design of the casting, blow holes often occurred. A 25% rejection rate on a run of 1000 castings amounted to more than $750.

Skilled labor is not required for this bonding operation. Adhesive bonding methods are adaptable to both short run or continuous production methods.



Cutaway section of adhesive bonded pump assembly showing the three adhesive bonded die cast sections.

The cost per part for adhesive assembly becomes negligible when compared to the rejection cost incurred with the previous method. Approximately one gallon of adhesive will assemble 1000 castings. This amounts to an adhesive cost of approximately 3.2 cents per part.

SMALL PARTS WASHING MACHINE CUTS COSTS

A new type automatic small parts washing machine installed in the Scovill Mfg. Co., Waterbury, Conn. has been reported to

Adhesive is applied to the butt shoulder joint of one of the die cast sections. The flat "X" shaped section is then assembled in place. Then the epoxy resin base adhesive is applied to the contact edge of the "X" shaped section and the stainless steel thin gauge square section is assembled in place. The square section is a wear plate to resist thrust of the pump rotor blade.

"speed production, conserve manpower and reduce costs."

The Industrial Systems DJ unit washes, rinses and dries headed parts while the fasteners are in, and inseparable from, tote boxes from start to finish. Boxes are locked to special mesh drums.

Rotational action can be adjusted for various tumbling speeds.

REDESIGN VALVE HOUSING FOR FURNACE BRAZING

A stainless steel servo valve housing redesigned to utilize furnace brazing resulted in a saving of 40% over the cost of conventional machining from bar stock.

Because of necessary internal shoulders and flanges, machining from the solid was expensive. The part is now fabricated as a brazed body and cover assembly. The

Stainless steel servo valve housing is now produced as brazed assembly of body and cover. Note serrations on cover which provide space for brazing alloy despite press fit of cover into body. This technique controls brazing clearance within .002" to .003" optimum design range.

body is produced on a screw machine from Type 347 stainless steel tubing, the cover from stainless bar stock on an automatic screw machine.

The cover is a press fit in the body to insure the best possible alignment, one with the other. The ring projection on the cover which fits into the body is serrated to provide space for the brazing alloy. The assembly is brazed, using nickel-based Nicrobraz alloy, in a pure dry hydrogen furnace at 2150°F. Then the bearing surfaces are finish machined. •

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Assembling the metering and film advance mechanism.

by **Milt Cherkasy**
Product Engineer
Apparatus & Optical Division,
Camera Works
Eastman Kodak Company

QUALITY CONTROL: THE HEART OF KODAK ASSEMBLY

What goes into the production of a modern camera? Using Eastman Kodak Company's Signet 80 model as an example, the answer is precise assembly methods and rigid quality control standards in fastening together more than 180 parts. And, that's counting each of the 29 sub-assemblies as single parts. One sub-assembly alone—the shutter mechanism—contains 80 components.

Since the camera weighs only 24 ounces, it's easy to see that most of the parts used in its construction are small. This in turn means that experienced people are required for the intricate assembly steps. Parts fastened together must meet close tolerances if the mechanisms of the camera are to operate properly. Also, the camera must be completely light-proof which means that all "joints" must fit tightly. Some joints are sealed with a liquid adhesive as a further safeguard against light leaks.

Assembled cameras are placed in cases supplied by an overhead conveyor. Filled cases are moved along vertical conveyor rails. The double line permits an accumulation of finished cameras at the inspection points, avoiding bottlenecks along the faster-moving line.

The Signet 80 is manufactured in the Camera Works plant of Kodak's Apparatus and Optical Division in Rochester, New York. Basic parts and sub-assemblies as well as fastening devices are made by Kodak. Some fasteners—usually standard items—are purchased from outside suppliers because of their low cost.

Of the cements and glues used on the camera, some, such as HE-910 for holding the flash contacts in place, are made by Kodak, others by outside suppliers. All adhesives, whatever their source, undergo rigid tests by Kodak chemical engineers before they are approved for use.

All of the individual parts, sub-assemblies and fastening devices used in the construction of the camera are stored in the assembly department's parts store room within the assembly area. Since the largest part used (the camera case) measures only six inches in length, bringing the parts to the work areas presents no problems and requires a minimum of time. Various materials handling techniques ensure a neat and efficient work area.

OVER-THE-BENCH CONVEYOR RACKS

As camera case assemblies are completed at the first operation, they are placed in trays on an over-the-bench conveyor rack in front of the operator. The conveyor extends the length of the assembly line. As trays are filled they are pushed along to the next operator. Stack bins on the bench at the operator's arm level, within easy reach, hold all parts in this phase of the operation. Components for daily use are stored in trays at the work place under the bench.

Beginning with the first operation, a small metal Kodakspot nameplate about the size of a dime, is glued onto the exterior of the camera case. Cases are then placed on a circular, wooden drying rack which has eight loading stations. The rack is turned like a "lazy susan" used in the home. By the time the drying rack has turned one complete revolution, the first Kodakspot-and-case loaded has dried sufficiently to be removed and packed in a tray, ready to move to the next operation.

FLATHEAD SCREWS ALIGN AND FASTEN

Next, the upper mechanism plate is attached to the camera case with two conical-base flathead screws which align and fasten the mechanism plate to the case. The winding mechanism, lower mechanism plate, and winding clutch and shaft are also added here to the case assembly, and secured by the same type of fastener. Various mechanism levers to the camera case assembly are assembled to the plate and retained by "E" rings.

At the third step, three conical-base flathead screws are used to fasten the shutter assembly onto the front of the camera case. Again, in this case, the conical base screw aligns the parts. Next, the film take-up basket is fastened to the case front with two self-threading screws, supplied by Parker-Kalon and Continental Screw. This eliminates the need for tapping operations and possible stripped screw threads in the polystyrene basket.

A coil type counter spring is added to the counter drum. This is fastened in place by putting one formed end of the spring into a small hole in the counter drum. The spring and counter drum assembly are assembled to the camera case with a counter cover. The Eastman-made springs are de-

continued

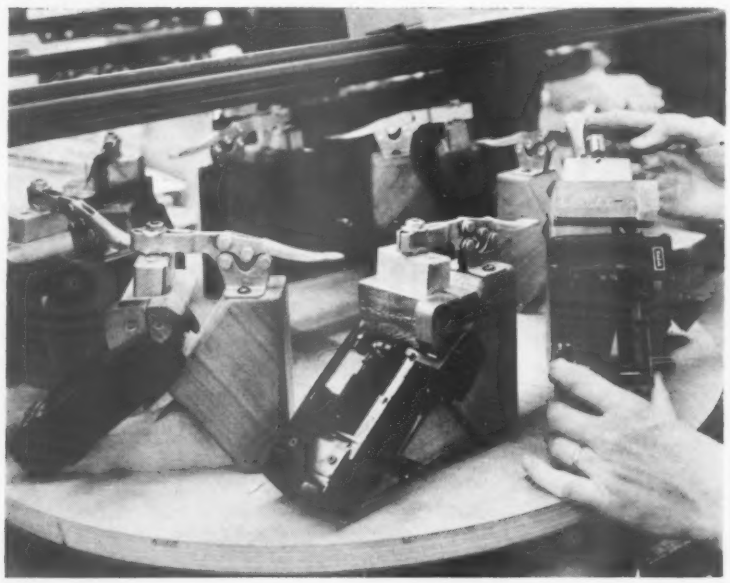
Assembly at Kodak, continued

livered to the operator glued lightly on a thick paper board to avoid tangling, This simple technique allows the operator to work at a constant rate without the exasperation of stopping to separate tangled springs.

In the fifth operation the rangefinder sub-assembly with viewfinder mask is completed and added to the case assembly. A movable mirror bracket attached to the rangefinder sub-assembly is held in place by the same spring that controls its ranging action in the camera. The cam follower arm, also attached here, is held in place with two opposing spring forces pulling against each other over two ball bearings. This ball bearing arrangement minimizes friction and fixes the cam follower friction point.

Another step sees the rangefinder assembly being attached to the camera case with conical-head screws which also align the rangefinder plate to the camera

Operator (top) assembles the metering and film advance mechanism, drawing fasteners from stack bins. Kodak nameplate (right) is cemented to camera case and placed under pressure of De-Sta-Co clamping block. One revolution of the lazy-susan allows the glue to cure.



A typical operation is performed with a Brown pneumatic press. A knurled steel stud is punched in an aluminum die casting.

assembly. This method assures that no external forces will distort the operation of the rangefinder.

Special rangefinding boxes with simulated distances of 2½, 5, 15 feet and infinity are used to adjust the cameras. This highly-skilled operation requires a technician with high visual acuity or the ability to judge when two lines come together at dead center in the range testing apparatus. Tolerances are three-tenths of the depth of field of the 50 mm lens. After the camera is "ranged," Elyptol adhesive is brushed on the threads of all mechanical fasteners used in this phase of the operation, which are then cemented in place. This is necessary because a location shift of as little as .00005" would upset the range setting.

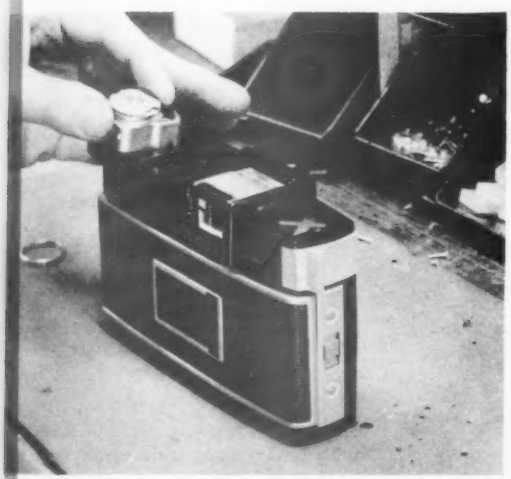
The seventh operation begins with the body release plate and the top housing assembly being removed to allow the operator to attach the light meter assembly. Brass screws are used to avoid affecting the magnetic field of the magnet contained in the light meter. An anchor plate is then fastened with two flathead screws, followed by the top plate. The body release plate is replaced on the camera, held in position on one side with a self-contained tongue, on the other side with a flathead screw. In this case, a flathead screw is used for flushness with a covering cemented over it.

In the last major operation a pre-focused, interchangeable lens is added, held firmly in place against the lens seat by means of two lens-locking levers. The operator also checks to be sure that the camera is focused properly.

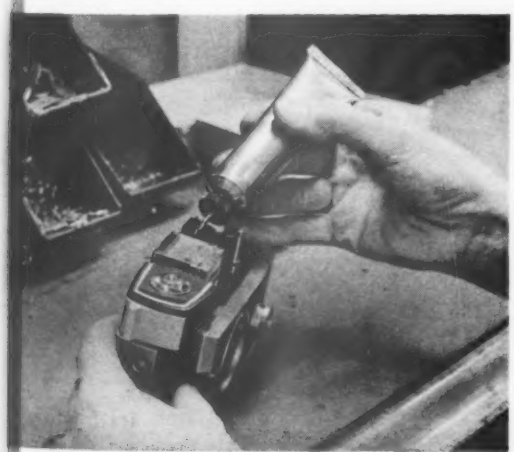
While these are the most important steps of the basic operations, there are, of course, many more operations on each phase on the assembly line as well as sub-assembly operations.

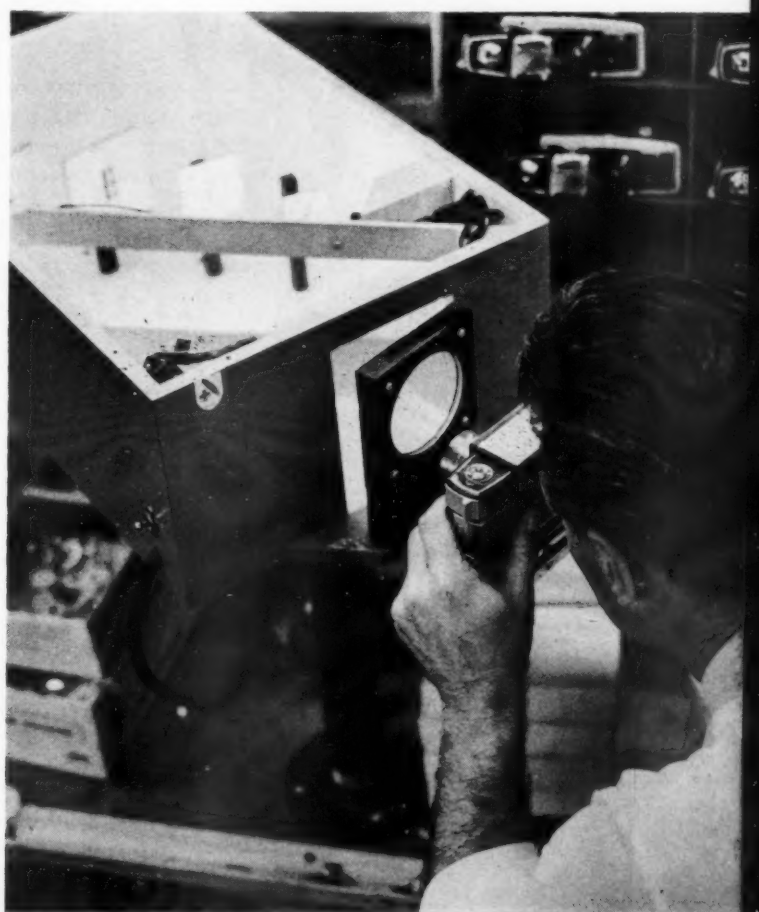
Fastening devices are especially important in the construction of the Signet 80 Camera. Here is a description of some of the fasteners and their use: The Signet's body release button bezel has a flange on the back which is turned over in four places to securely fasten to the top body release plate. A power-driven Electrostaker is used to perform this

continued



Light meter (top) is secured with brass screws. Cement (bottom) applied to screws prevents adjusted rangefinder from shifting.





In checking the range finder on the Signet 80, the camera is moved at an angle to focus on each of the charts in a special rangefinding box. The charts represent distances of 2½, 5, 15 feet and infinity. Inspectors must have 20/20 vision either with or without glasses.

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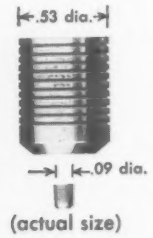

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operation, one of the 29 subassemblies contained in the camera.

Knurled steel studs, made on an automatic screw machine are used to assemble the lens lock levers to the camera's cast front housing. The two parts are placed in a metal fixture and a Speedy air press machine is used to press the studs home.

Clinched lugs, an integral part of the bezel, are used to fasten the speed dial bezel to the front housing. The lugs help to align the two parts in addition to securing them. This is also done on an Electrostaker.

Truarc clutch retaining rings, also called retaining "E" rings, are used to hold various parts in position. They are used to attach levers to the metering mechanism plate and to assemble the clutch assembly. Retaining rings offer positive locking characteristics, ease of use, compactness, accuracy of position, and low cost.

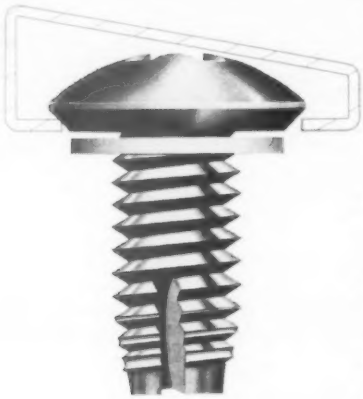
FLANGE SPINNING

A spinning tool is used to "spin over" the flange of the brass rangefinder post to anchor it securely to the camera's rangefinder plate. This is performed on a drill press with a special spinning tool and fixture.

Extruded bosses formed in the rangefinder mechanism plate are headed over to hold the flat type rangefinder follower spring to the mechanism plate.

Flatheaded screws are used extensively in the camera's construction, especially on the exterior because they set flush with the camera's surface and align various parts. This provides an attractive finished appearance.

What does all this precision assembly add up to in the finished product? The Signet 80 features a combination rangefinder, lifesize viewfinder and a built-in exposure meter to provide the user with exact, easy-to-read camera settings. The camera has a standard f/2.8 50mm lens which can be interchanged with either a 35 mm wide-angle or 90 mm telephoto lens. •



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Ideas like this are important to you whether you make refrigerators or not. This one is typical of Shakeproof ingenuity in research and development that daily creates new ideas for industry . . . ideas to improve product performance, to speed assembly operations, to lower total costs. It represents the kind of creative engineering characteristic of Shakeproof designers and engineers who are available to visit your plant, to study your assembly methods and problems and to design ingenious new fastenings for your specific application.

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WHICH THREAD -

When should fine or coarse threads be used? What are the strength considerations? Which will take a higher torque load? What about the cost aspects?

by W. G. Waltermire
Chief Product Engineer
Lamson & Sessions Company

As far as I can determine, using hand torque stop-read-and-start methods, Fine Threads produce connections about 10% stronger in nuts and tapped materials such as rolled steel, cast iron and harder materials. Further, they will stand higher ultimate torques, providing added protection against torsional failure at a given assembly torque. They produce higher clamping loads to protect against fatigue failure and joint slippage. In the harder materials they are certainly easier to tap since the thread depth is less and the advance of the tap in one revolution is also less.

One is tempted to assume, therefore, that the fine thread would be generally preferred for bolting, particularly in the many cases where users torque to, or above, proof load in the search for better clamping force on the joint. In this case the desirability of the higher proof and ultimate strength of the fine thread is obvious. Still, many industries and companies decide in favor of the coarse thread, mainly because:

1. It assembles easier. An engineer of one large automotive producer says fine threaded nuts must be started by hand on bolts, while coarse threaded nuts can be inserted in the driver socket and driven automatically, resulting in a saving of time. Not every one agrees with this, but the fact is that a coarse threaded nut or screw does provide a better start with less chance of cross threading.

2. Burrs are less likely to affect assembly and assembly torques. This is true, particularly, on non-heat treated and/or large size fasteners, which are likely to be burred in mass-handling and transportation. Rotary gas heat treating furnaces are being rapidly supplanted by gas or electric furnaces in which the work is fed evenly through on flat aprons. As this replacement progresses, the fear of damage to threads of heat treated bolts, coarse or fine, is not so great.

3. Coarse threads provide more room for plating or other additive finishes of a given thickness.

4. Coarse threads are less likely to seize and make for difficult removal in temperature applications, or joints where corrosion may form. Anyone who has had to remove muffler bolts from his automobile will quickly recognize the truth of this statement.

5. A large segment of industry is not concerned with developing high clamping loads, but have such large design safety factors, either by choice or by

- -COARSE OR FINE?

some code requirement, that bolts are only stressed to a portion of their potential strength.

6. At about the 1-in. size, fine thread nuts tend to strip earlier. This is because nut dilation may produce earlier disengagement of the shallower fine threads.

7. When tapped material is brittle and friable, it is impossible to tap a clean fine thread.

These very important reasons—not strength—mainly account for the greater popularity of coarse threads over fine threads. Unfortunately, the statement is often made that coarse threads drive faster because they assemble with fewer turns; this is difficult to support for the actual driving time of either thread in assembly is very short.

Similarly, it is often stated that coarse threads are less expensive to produce and this certainly warrants investigation. At the 1958 Fastener Seminar at the University of Wisconsin, one speaker said that the cost of producing each thread is about the same and with this I agree. In fact, the fastener industry should also agree since there is no price distinction on those standard parts which provide for either thread.

It has sometimes been said that the coarse thread is as strong as the fine thread, but, in my opinion, this requires more investigation and explanation of the conditions of usage. Generally, it is stronger in relatively soft materials such as aluminum, die castings and the like, and I recommend its usage in these cases on the basis of strength. For the mass of applications, though, I feel the fine thread is stronger in torque-tension, ultimate load and shear.

To investigate torque and tension, we cold headed a lot of C1038 bolts in the ½-in. size to the ½-20 blank size and reduced half of them to the ½-13 blank size. We then roll-threaded both series to produce about the same percentage of thread depth and heat treated them together to the same standard hardness, producing the following strength on direct tension tests with the bolts assembled in hardened adapters:

		½-13		½-20		% Load
Grade	Hardness	Load	Stress	Load	Stress	Advan.
SAE Grade 2	R/B 94-95.5	13,340#	94,200 psi	14,600#	91,400 psi	9.5
SAE Grade 5	R/C 28-29	18,400#	130,000 psi	21,000#	131,500 psi	14.1

It is interesting to note that the ratio of unit areas, fine to coarse, gives a theoretical 12.7% advantage on the ½-in. size. Perhaps the greater necking of SAE Grade 2 bolts is responsible for that grade developing less load advantage.

In practice, a fastener is torqued to produce the desired pretensioning or clamping load. In a tension application, failure of such a part in service will be in direct tension due to addition of external load. Obviously, the fine thread shows a superiority here.

THE FUNCTION OF A NUT

Nuts are a different matter. Note the bolt stresses reported above when bolts were taken to ultimate destruction in direct tension in an adapter. The function of a nut is to stand the minimum rated strength of a bolt without failure. In other words, a nut should ordinarily develop the strength of a bolt without stripping the nut. Above this level, it does not matter much which series produces the highest nut stripping strength.

To investigate this, we cold forged ½-13 heavy hex nut blanks, reaming half of the ½-20 minor diameter to produce an equal percentage of thread depth. Both series were then tapped to about the same fit on their respective GO (LO) thread plug gages. Nut hardness was R/B 93-91 for both series. We also annealed some nuts of each series to produce soft nuts of R/B 45-47 hardness to simulate low strength tapped hole materials. Nuts were then tested in direct tension for strip loads on hardened mandrels, with the following results:

	½-13		½-20	
	Load	Stress	Load	Stress
As Forged	27,600#	194,800 psi	26,700#	167,200 psi
Annealed	17,100#	119,600 psi	18,400#	105,000 psi

Note how the stripping strength of these relatively soft "as forged" nuts exceed the breaking loads of the harder bolts.

It is obvious that both thread series in the "as forged" condition develops nut stripping loads and stresses higher than the bolt breaking strength. Therefore, no advantage was listed above for either series. Based on load, the actual criterion of strength, the coarse thread had a 3.2% advantage, but this is actually technical, not a real advantage. We were surprised that the coarse thread did not show an advantage on stripping strength of the annealed nut.

We then torqued the "as forged" nuts on SAE Grade 2 and 5 bolts, taking them to destruction and reading the torques and tensions at every step; in actual usage bolts and nuts are not intentionally

continued

Why are fine threads not in greater usage in high load applications?

torqued to destruction. All bolts necked and broke, results as follows:

	½-13		½-20		% Torque	% Load
Grade	Torque	Load	Torque	Load	Advan.	Advan.
SAE Grade 5	130 ft.lbs.	15,450#	150 ft.lbs.	18,120#	14.5	17.2
SAE Grade 2	95 ft.lbs.	11,050#	100 ft.lbs.	12,600#	5.2	13.9

The demonstration of the strength superiority of the fine thread bolt-and-nut assembly is to expected. We often, though, overlook the fact that fine threads, under these conditions of assembly, will take higher torque loads before failing. Torque failure in assembly may occasionally occur because of wrenching conditions, lubricating platings or coatings, out of square assembly conditions which impose eccentric loads and variations in material strength, and thread workmanship. Obviously, the fine thread bolt has a larger thread root diameter, so the fine thread has higher torsional strength.

Actually, since bolts and nuts are not designed to be torqued to failure, we are primarily interested in the loads developed at actual assembly torques. For a given assembly torque, the above tests showed:

	½-13		½-20		% Load
Grade	Torque	Load	Torque	Load	Advan.
SAE Grade 5	90 ft.lbs.	10,510#	90 ft.lbs.	11,200#	6.6
SAE Grade 2	60 ft.lbs.	7,060#	60 ft.lbs.	7,790#	10.2

The lesson from the above can be reversed; that is, for a given clamping load, less torque is needed by the fine thread.

General Motors Euclid Division, for one, recognizes the ability of a fine thread bolt to withstand higher torque loads. They, and most users, set assembly torques higher for fine threaded products than for coarse threads. They choose to assemble to a load equal to ¾ the Proof Load. Using their recommended torques, we found the above bolt and nut assemblies tested as follows:

	½-13		½-20		% Load
Grade	Torque	Stress	Torque	Stress	Advan.
SAE Grade 5	75 ft.lbs.	8600#	90 ft.lbs.	11,200#	30.3
SAE Grade 2	50 ft.lbs.	5860#	55 ft.lbs.	7,150#	21.8

This, to my mind, is the best index of the strength superiority of fine threads over coarse threads as long as the nut is made of common steel or higher strength material. The higher assembly loads obtained also provide more elastic bolt strain, making for greater protection against fatigue failure.

This also raises the tantalizing question—cannot a designer, for a given design strength, reduce fastener size and costs by simply using a fine thread? This only applies to those applications where torque is or can be controlled in assembly.

Why then, in view of strength advantages, are fine threads not in greater usage than coarse threads, particularly in high load applications where coarse threaded bolts are today being stressed to or above yield point to get the highest clamping load?

The construction industry uses SAE Grade 5 (ASTM A-325) coarse threaded bolts with heavy hex nuts, just as these tests were made. Their answer, I am sure, is easier assembly and less susceptibility to burrs and thread nicks. In this case I doubt if the lack of data such as presented here, was a factor. Thinking of all industry in general, those to whom clamping load is a vital factor, I believe that the lack of sound test information is involved. We should note that the aircraft and automotive industries are large users of fine threads, very likely reflecting conclusions drawn from their own tests and observations. These industries generally have large laboratories and staffs and can conduct work which smaller industries and companies are unable to do.

Industry has been under pressure to reduce costs. One means to do this is to use only one thread series. With this, I go along with the qualification of, "one thread series for a given size and type of product." From a user's standpoint this permits simplification and reduction of the stock carried by him. It means for a given size and type of product, that the user ought to weigh all the practical design considerations of all his applications. Then, for each size and product type, he should decide which thread, coarse or fine, is the best for all his applications, all things considered. This permits the same degree of savings through reduction of gages, taps and the number of fasteners, that would be obtained by using one thread for all sizes, all types of products.

As previously reported, coarse threads proved better than fine threads in tests with the annealed nuts on SAE Grade Bolts. At 90 ft. lbs. torque, ½-13 bolts developed 8950# while ½-20 thread nuts developed 7250# bolt loads. ½-13 bolts stripped nuts on SAE Grade 5 Bolts. At 90 ft. lbs. torque, ½-20 nuts stripped at 11,000# with 210 ft. lbs. torque. As the length of thread engagement is increased, which is normal practice for non-ferrous material, a point will be reached at which the bolt will break instead of the tapped material stripping. To get a comparative evaluation of the coarse and fine threads, in these tests, we maintained one length of thread engagement for both thread series.

The new B1.1 American Screw Thread Standard and the 1960 SAE Thread Handbook are being published. The Government Interdepartmental Screw Thread Committee Handbook, H-28-1957 is being revised. All three have essentially the following to say on "Usage of Thread Series," which really sums up the findings reported:

"Coarse thread series. This series, which extends up to 4 inch diameter is generally utilized for the bulk production of bolts, screws, nuts and other

continued

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general engineering applications. It is used in general applications for threading into lower tensile strength materials such as cast iron, mild steel and soft materials (bronze, brass, aluminum, magnesium and plastics) to obtain the optimum resistance to stripping of the internal thread. It is applicable for rapid assembly or disassembly, or if corrosion or slight damage is possible.

"Fine thread series. This series, which extends up to 1½ inch diameter, is suitable for the production of bolts, screws, nuts and other applications where the coarse series is not applicable. External threads of this series have greater tensile stress area than comparable sizes of coarse series. The fine series is suitable when the resistance to stripping of both external and mating internal threads equals or exceeds the tensile load carrying capacity of the externally threaded member. It is also used where the length of engagement is short, where a smaller lead angle is desired, or where the wall thickness demands a fine pitch. It may also be used for threading into lower strength materials where maximum strength of the external thread is not required; otherwise the length of engagement must be selected to meet the above required strength conditions."

We have much to learn before we can make broad, flat statements on this subject. For one, with new torque-tension recording devices now being developed we can learn whether the conclusions presented here will prove equally valid when nuts and bolts are power-driven, as they normally are. We need to investigate the Fin. Hex nut series more thoroughly. For these tests I chose Heavy Hex nuts because they are used by construction and other industries, and because, for a direct comparison of thread series alone, the extra dilation of Fin. Hex nuts should not be a factor. This must be checked out separately.

At the beginning of this article, I listed advantages of Coarse Threads. I will conclude by listing those of Fine Threads. They are:

1. Stronger in hard nuts or tapped materials.
2. Develops more clamping load for a given torque.
3. More elastic strain at assembly torque, providing higher resistance to fatigue failure.
4. Requires less torque for a given clamping load. This may permit use of lighter, faster drivers.
5. Greater torsional strength.
6. Better adjustment, such as needed for cam follower screws and set screws. This adjustment is also a factor where cotter pins are used with slotted nuts and drilled bolts.
7. Threads can be rolled closer to the screw or bolt head, since thread runout is a function of pitch. This is particularly important where washers are preas-

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sembled to either bolts or screws.

8. More resistance to loosening, due to the lower helix angle.

9. Better for short lengths of thread engagement.

10. Better for thin-walled materials as tapping torques are less.

I find that one of our experienced machine designers normally specifies fine threads; another, equally experienced, normally specifies coarse threads. The former accented the greater strength and adjustment advantages of the fine thread. The latter pointed out that assembly torques cannot be controlled through the life of a machine tool, and that, with hand tapping it is easier to produce an 80% coarse thread than a fine thread. The opinion of another engineer is that it hand taps as well. Our designers, like those throughout the country, are interested in actually weighing all considerations with the aim of using the best and most economical thread for the application. Yet here are a few of a group of engineers, working within a few feet of each other, all very experienced, with definite and conflicting opinions. As a move is now on to reduce thread series to one type, decisions should be made on facts, not on unsupported opinions. In this article it is not my intention to promote one thread or the other, but to contribute to factual discussion. •

This article is based on an address by the author before a symposium on "Industrial Fastener Applications" at the University of Wisconsin, November 19-20.

"I know it's not the best method of fastening. But what can I do? The design has been frozen."

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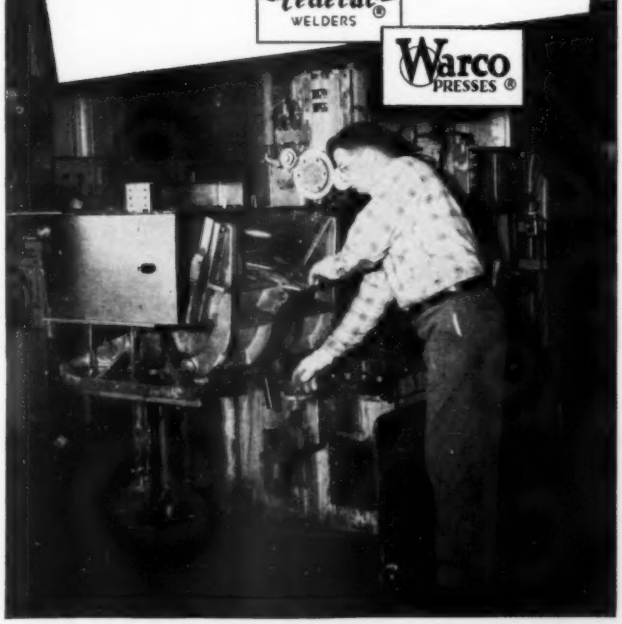

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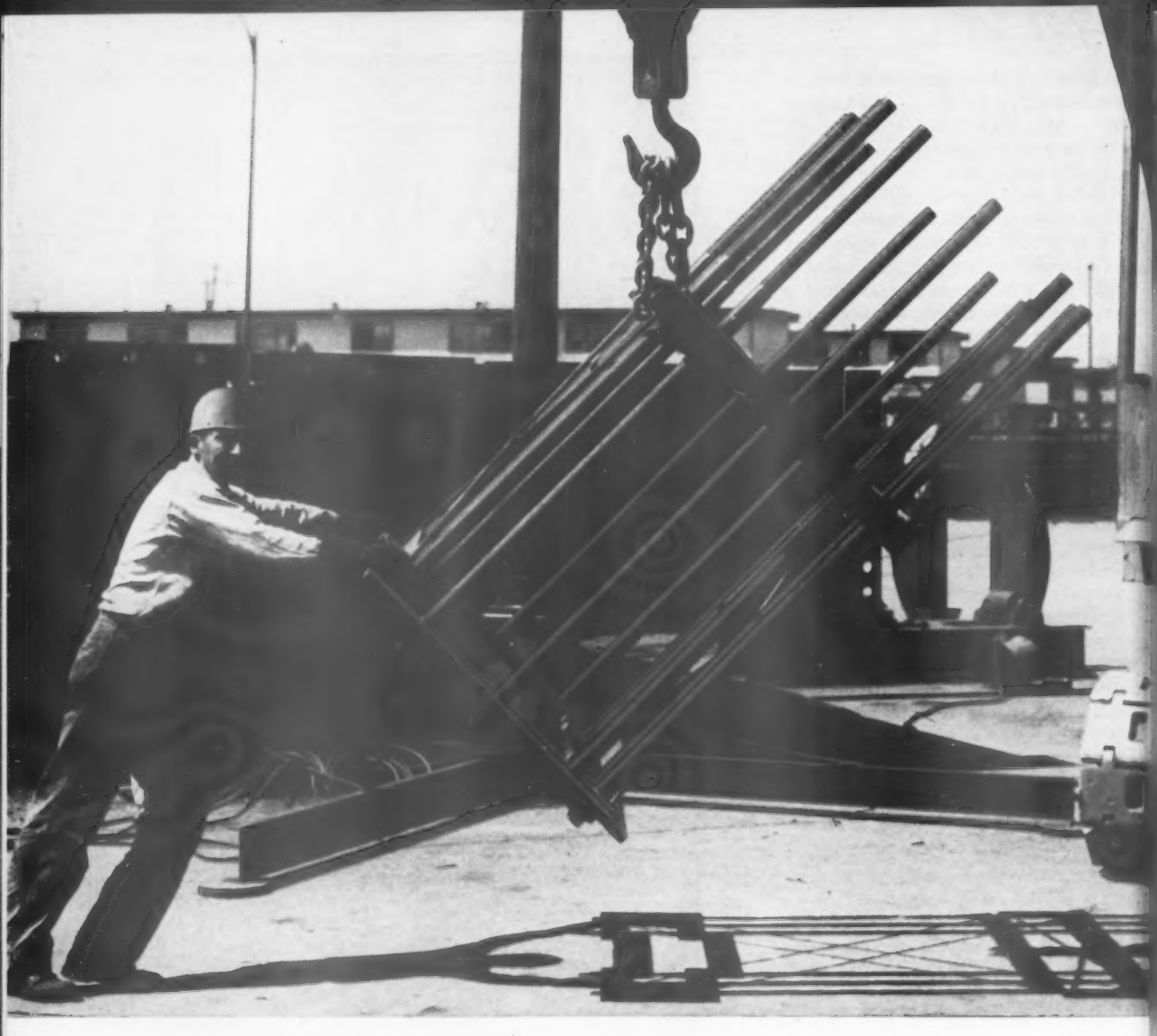

Big bolts for the Giants' ball park

Threaded foundation bolts, two inches in diameter and eight feet long, 14 of them in all, were welded into this mammoth cage. This section will be embedded in concrete as an anchor for one of several steel shafts supporting the lighting system for the San Francisco Giants' new Candlestick Stadium.

The range of Bethlehem standard fasteners is wide enough to handle most bolting requirements. But quite often a special job, such as this one, calls for a special fastener designed to meet the specific need.

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Candlestick Stadium, the new home of the San Francisco Giants

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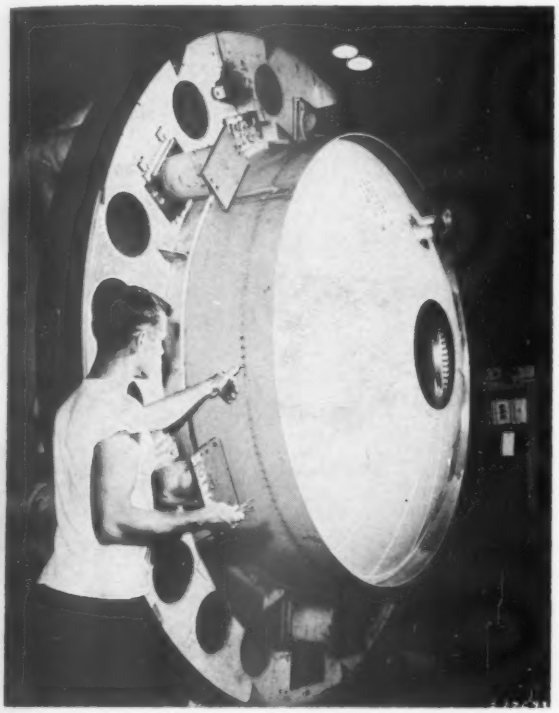
New fastener is used in Thor missile to help leak-proof the liquid oxygen compartment

MISSILE USES SELF-BROACHING BOLT



Bolt pin is inserted from outside of liquid oxygen compartment. and pulled through from inside (see next page).

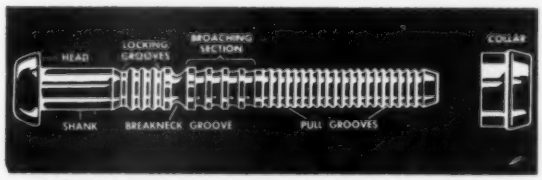
The possibility of leakage of liquid oxygen fuel is prevented in the Thor missile through the use of a new fastening idea—a self-broaching bolt—conceived by engineers at the Douglas Aircraft Company, in Santa Monica, California.

The patented Douglas development is regarded as an important breakthrough in efforts to continually improve missile reliability. The new fastener is being produced by Huck Manufacturing Co., whose research staff worked with Douglas engineers in the final development.

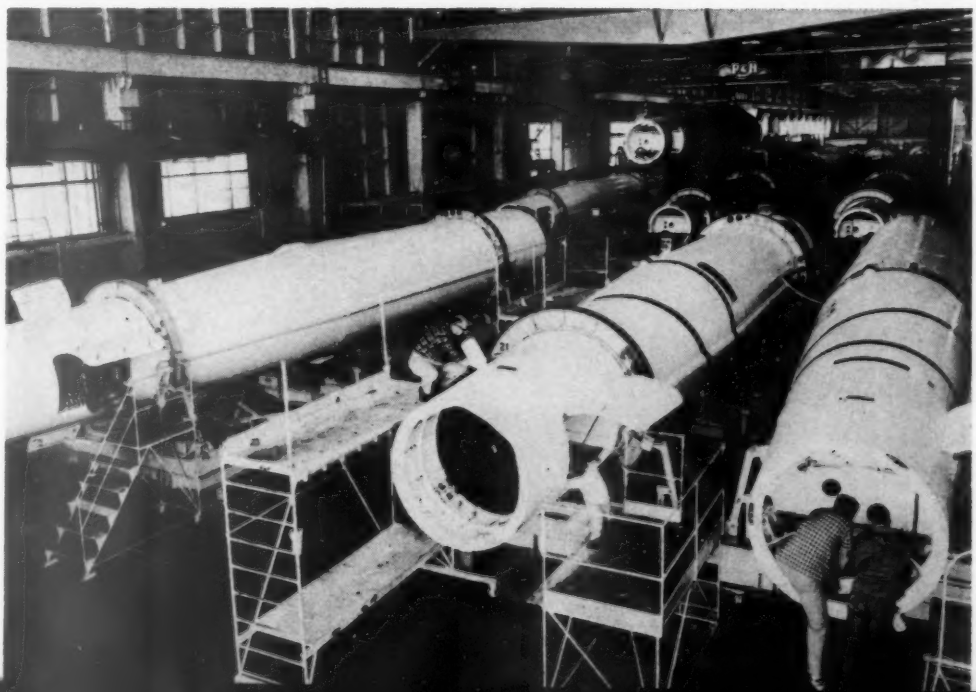
"Douglas engineers came up with the idea of applying integral broaching teeth to our close-tolerance Huckbolt fastener," explains H. G. Brilmyer, vice president of research & engineering for Huck. "The fastener is thus able to finish-broach its own pre-drilled hole during installation."

This new fastener is used by Douglas to secure the liquid oxygen compartment bulkhead of the

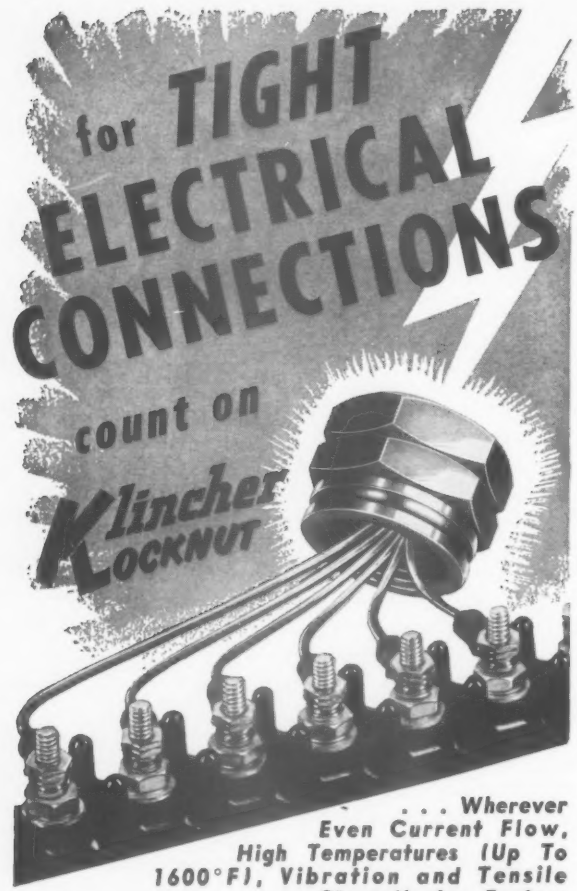
continued



The new self-broaching lockbolt is a two-piece fastener, with the nomenclature as shown.



View of the final assembly line for Thor missiles at the Douglas plant in Santa Monica, Calif.



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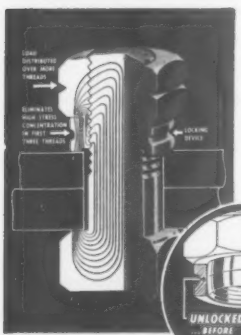

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Thor missile. It produces a tight fit between the bolt and the hole; the fastener literally is pulled into an undersize close-tolerance drilled hole.

Tolerances and standards maintained during missile assembly with this new fastener insure a precise fit within ± 0.00075 inch, which is less than half the thickness of a human hair. The mechanical seal thus produced has been found most effective in resisting forces imposed by the payload of liquid oxygen carried by the Thor.

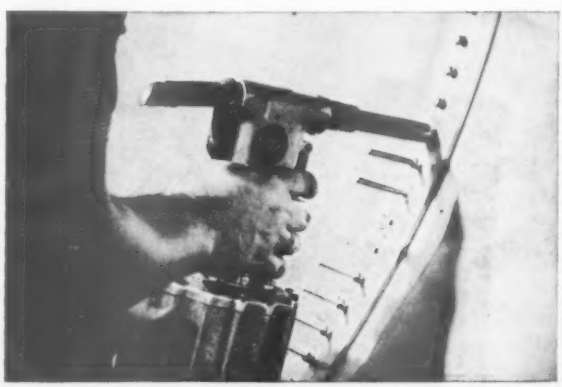
Also important in the Thor application is that the self-broaching fastener pin is installed "dry", as contamination from a non-compatible lubricating or sealing compound could cause premature firing of the liquid oxygen.

The search for this new fastener began when Douglas engineers were seeking a simpler means of achieving a positive, controlled interference fit installation of lockbolts in their DC-8 program. They studied the possibility of applying broaching teeth to the lockbolt pin. This was a logical approach since both the broaching operation and the lockbolt installation involved a pull-through action.

Early tests indicated the validity of the self-broaching theory, but production problems could not be solved in time to meet the DC-8 needs. But the new fastener was ready about the time the Thor missile development program reached the stage where the need was acknowledged for a means of insuring leakproof liquid oxygen compartments.

The self-broaching fastener is installed by means of a double-driving technique. The fastener pin is first pulled into the hole and fully seated before the collar is applied. This contrasts with conventional clearance-hole application wherein the collar is applied over the pintail in the first step.

The hole is broached by pulling the fastener pin through, with the aid of a pneumatic or hydraulic tool set for low pressure operation. After the pin is fully seated, the tool is removed and the collar applied. The tool is again applied and the collar is swaged with tool set for high pressure operation. •



Installing self-broaching bolt in bulkhead joint of Thor missile, using pneumatic installation tool. Technique produces leakproof joint in liquid oxygen compartment.

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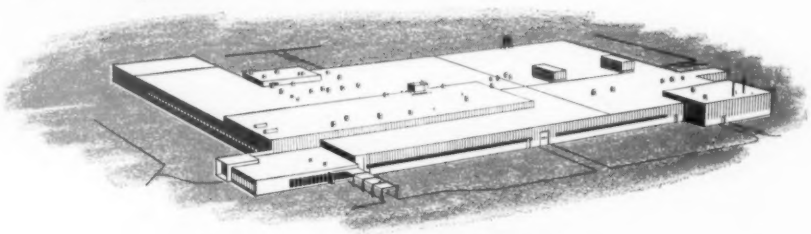

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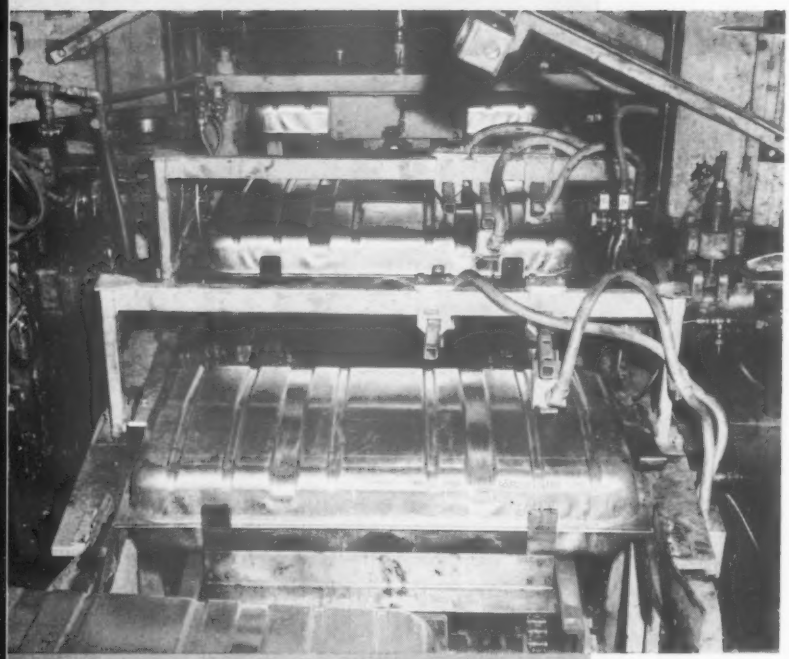

Sections of gas tanks are mated and seam welded along flanges by machines positioned on both sides of a conveyor.

SOLDERING AND WELDING

Production of gas tanks for cars is one activity of the sheet metal plant of the Buick Motor Division, General Motors, Flint, Mich. Methods employed, especially in assembly, have been accelerated and otherwise improved for 1960 models both to promote over-all economy and to insure high quality.

Both halves of the gas tank are drawn from .0255″ terne plate having 12-lb. nominal coating and include wide flat flanges that are joined by seam welding. This is done in a conveyorized setup with welding machines at each side of the conveyors. After the two tank stampings are placed flange-to-flange, four spot welds are made at the flanges to hold the halves in position for seam welding.

Parallel seam welds are made first on the long sides using electrode rolls 5/16″ thick and 10″ in diameter when new. They are RWMA Class No. 1 copper alloy of 70-72 Rb hardness. Mating drive wheels are 5/32″ thick and have 45° diagonal knurling on the periphery, with edges blended to side faces by .090″ radii. Normal welding speed is 160 to 180 ipm and the pressure applied is 700 lb.

Primary current in the seam welders is 130 to 136 amp, using welders of 200 kva capacity with phase shift of 78% ±5%. Welding wheels are used until the original 10″ diameter is reduced to 8″ by wear and dressing. Dressing of rolls is done at least twice per 8-hour shift, edges making a 10° angle each side. Lathe truing of peripheries is done whenever flats are found. Following checks on the seam welding setup are made daily or oftener if needed, primarily to insure proper weld quality.

Limit switches are inspected to make sure that they function neither too early nor too late. Alignment of weld rolls and drives is corrected if needed,

How Buick is turning increased automation in conveying, fixturing and testing on its gas and vacuum tank assembly line into a higher quality product.

GAS AND VACUUM TANKS AT BUICK

as are also the flow of water to these rolls, the condition of knurling on drivers and the pressure between the rolls. Also checked is weld roll alignment in relation to the transfer conveyor and that in relation to the flange edges and to the radius at tank body. A hammer and chisel are used to part the welds on all four sides of a tank, chosen at random, in order to check the weld quality, this being repeated oftener if tests reveal leaks that necessitate excessive repairs. Lower weld rolls are kept ⅛" to ¼" above track level to be sure that tracks do not interfere with proper welding. A GE pressure gage is used once a week to insure that the regular gages used to measure the weld pressure applied are not off calibration. All such checks help to assure good weld quality.

When both long and short side welds (made in pairs and crossing at each corner of flanges) are completed, tanks are ready for fittings to be soldered in place. Most such work is done on conveyors whose speed is kept constant so that the rate of tank advance does not change. This is important since a specified time is required to heat each joint to a temperature just sufficient to melt the solder and to cause it to flow uniformly over the surfaces to be joined without any solder running to waste because of overheating. Joint surfaces are fluxed before the parts are placed in position.

Heating is done with natural gas fed to groups of burners, some of which are mounted on carriages above the conveyor and also above the tanks ad-

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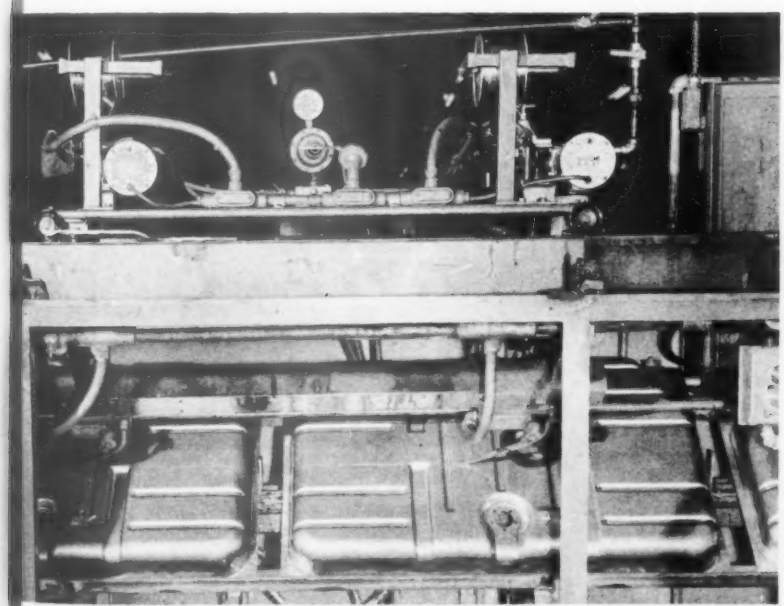


Vent pipes are soldered to gas tanks two at a time. Hidden from view and supported by a carriage are two soldering units and gas burners.

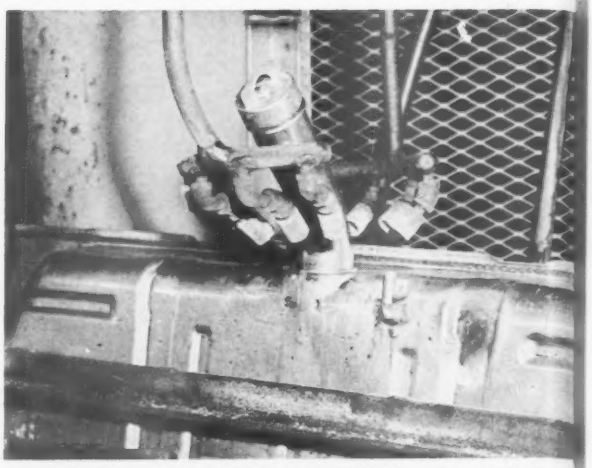
Flux and a solder ring are applied to a filler spout before tank is heated.

vancing on it. Gas flow is kept constant and heating is confined, as far as is feasible, to the areas to be soldered. Dual setups are used to solder vent pipes two at a time. In this case, burners are advanced quickly to the desired position by supporting carriages and then travel at conveyor speed, so as to remain in constant position relative to the work pieces just long enough to heat the areas to the required temperature. Then, the burners are moved back quickly to pick up the next pair of tanks and repeat the cycle.

Photo on preceding page shows carriage on a track above the conveyor but the burners themselves are hidden by portions of the assembly. Each set of burners is below a carriage-supported unit that feeds a fixed length (about ¾") of solder wire of 1/16" diameter from a reel, automatically, at the instant when the metal at each joint attains the correct soldering temperature. This is determined by the time the burners are in heating position and by the constant rate at which the gas-air mixture is supplied to burners.

Solder melts almost instantly as it strikes the joint and runs into it, partly by capillary action. Thereupon, heating ceases, because the carriage moves the burners back quickly to pick up the next pair of tanks, then advancing with them. Solder freezes as soon as the burners are removed.

Filler pipes are applied as tanks are advanced on edge along another conveyor. At its first station, an operator sets in place the filler pipe and a ring of solder that fits it and then brushes flux



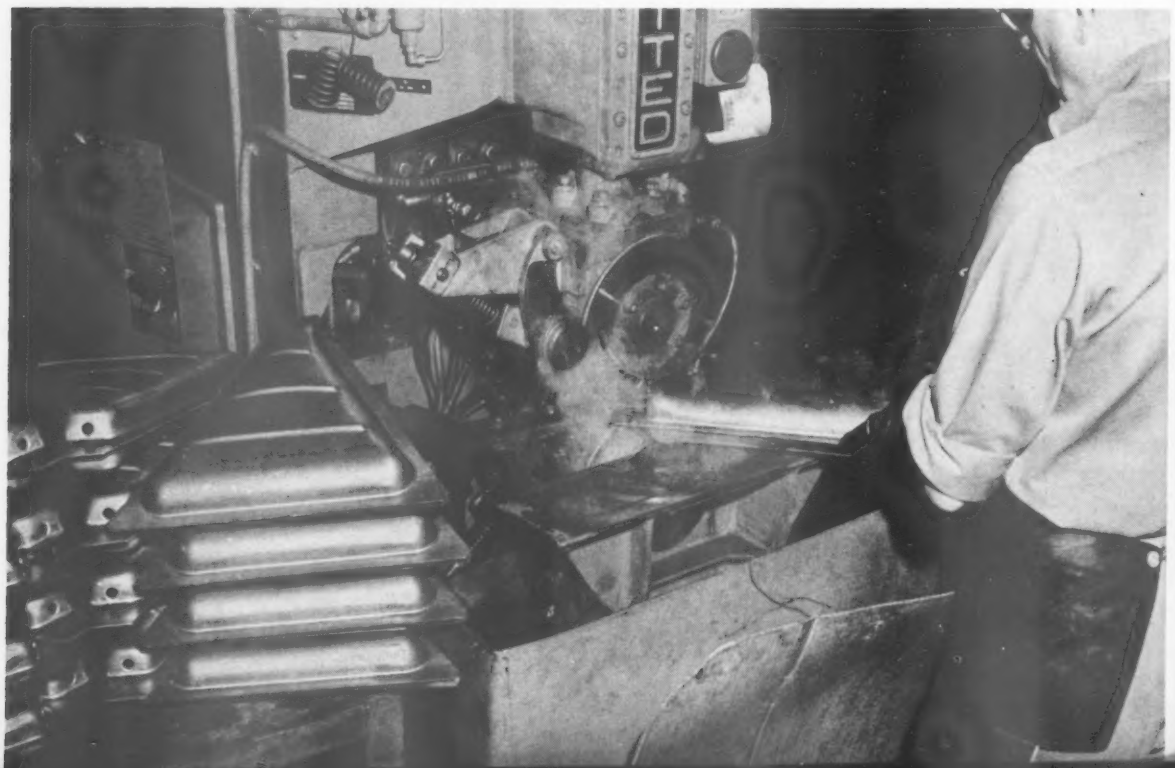
A carriage-supported, six-jet gas burner moves with the conveyor until solder ring is melted, then retracts to pick up the next tank.

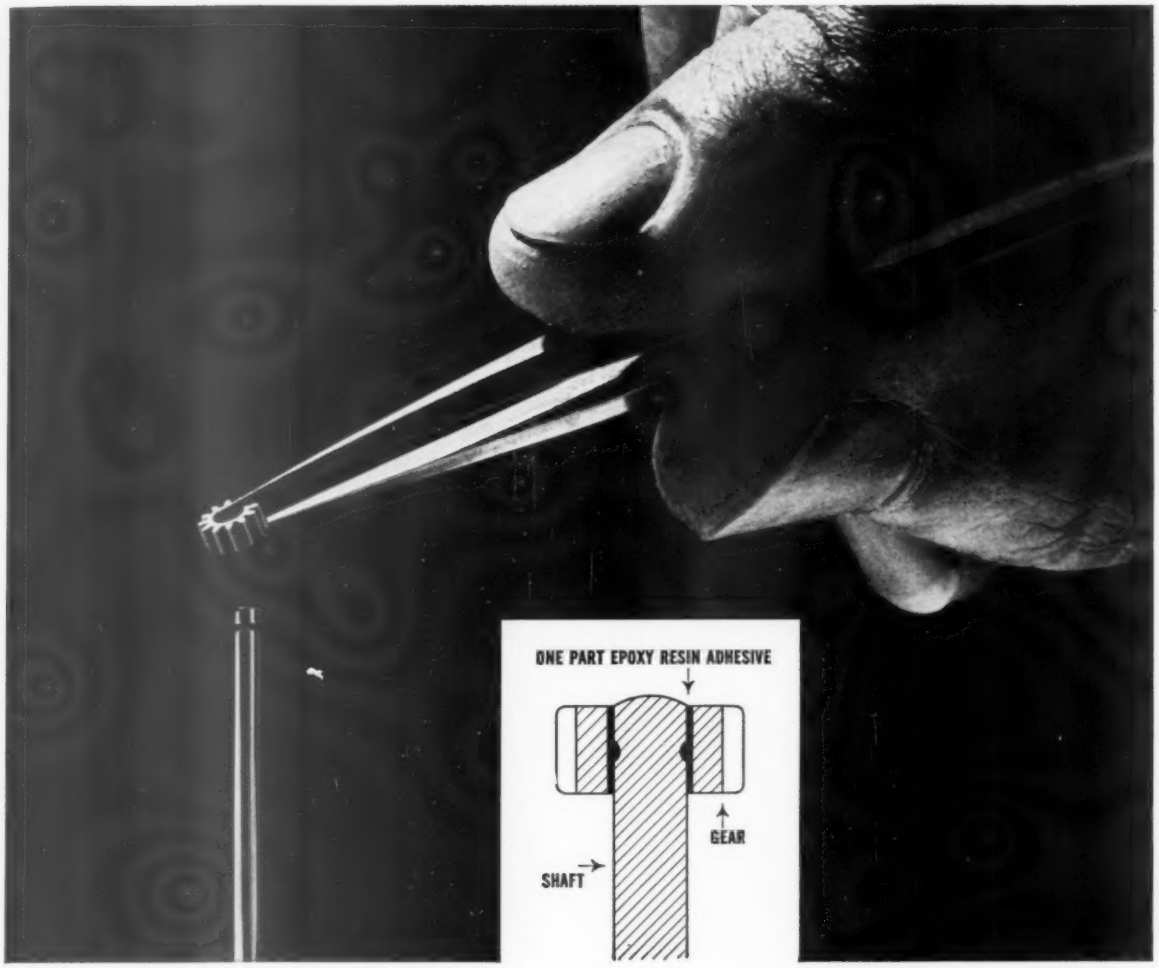
on the surfaces to be joined. As the assembly advances along the conveyor, the surfaces to be heated come between two sets of three gas burners, supported on a carriage that then is moved forward with the tank until sufficient heat is applied to the parts to melt the solder.

As soon as this occurs, the burners are moved back quickly to pick up the next tank on the conveyor and are advanced with it, as before. Thus, heating is automatic, as in the other setup, but the solder ring is applied by hand. After heating, the solder cools and freezes as the tanks continue along the conveyor. Finally, they reach the test station, where they are air clamped, one at a time,

continued

A seam welder joins the flanges of triangular vacuum tanks for Buick cars equipped with power brakes. At corners, the operator swings the tanks through arcs for a continuous weld with a short overlap at the narrow end.





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between the halves of a fixture and, after all outlets are sealed by rubber caps, are dunked in water while air pressure is applied at 5 to 9 psi inside the tank.

If any leaks are present, air bubbles reveal their location and the spots are marked by the operator. After tanks are elevated, pressure is released. Leakers go to a repair bench and those passing the leak test are ready for assembly to chassis.

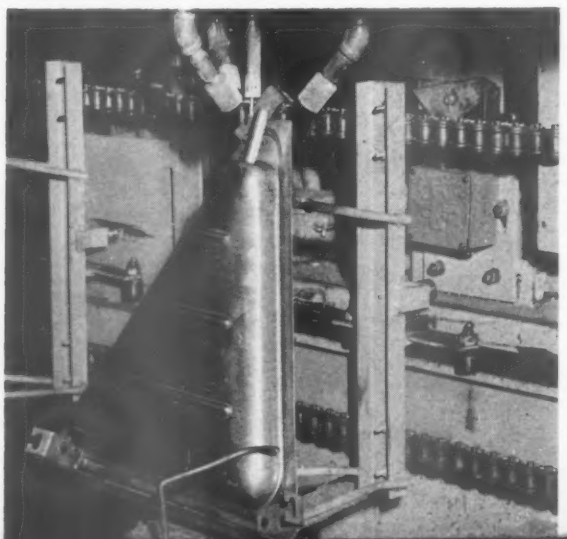
Vacuum tanks, applied only on cars equipped with power vacuum brakes, are much smaller than gas tanks and are not required in such large quantities. They are of triangular shape, to fit the space available for them in the chassis, but, like the gas tank, are drawn in two halves with mating flat flanges that are joined by seam welding.

Only one tube connection is needed on each vacuum and this short tube is set in an extruded hole at the narrow end. The tank is placed in a fixture attached to a double-chain conveyor. This conveyor passes below a soldering machine having a carriage that supports a three-jet gas burner and a tube through which a fixed length of solder wire is fed after the parts to be soldered are heated to the required temperature.

Heating is automatic and continues as long as the carriage moves at conveyor speed, keeping the jets playing where heat is needed. As soon as the required temperature is reached and solder is fed, the carriage is moved back quickly to pick up the next tank coming along the conveyor and starts the next cycle. Heating and solder feed in this manner are completely automatic and faster than in a manual setup, besides saving the time of one operator.

Tanks continue along the conveyor until they are moved by hand and are placed in a fixture designed to test two tanks at a time after they are filled with air under 20 psi. This test procedure is similar to that applied to gas tanks. •

As three burners heat the joint, a unit of the carriage (not shown) feeds a fixed length of solder which fastens a short tube to the vacuum tank.



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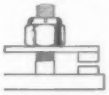
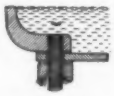
Elastic Stop nuts cost only a little more than the combination of fasteners used here. But can you afford the *real* price of any low-cost fastener that fails to provide reliability? For it's precisely this type of false economy that ruins reputations when customers incur costs for repairs, downtime and loss of production. As a matter of fact, the cost of extra field service may wipe out the manufacturer's profits, too.

Detailed photos are available showing exactly how Elastic Stop nuts solve critical fastening problems on rock drills, scrapers, snow plows, off-the-road truck and other heavy equipment. You can see these photos simply by writing to us. Or, we can send you test samples of the fastener sizes you need. Just write: *Dept. S42-297, Elastic Stop Nut Corporation of America, 2330 Vauxhall Road, Union, New Jersey.*

Elastic Stop nuts offer 3 important design advantages:



Precision adjustment at any point on the bolt



Prevent leakage along bolt threads

Nylon locking insert is re-usable 50 times or more

ELASTIC STOP NUT CORPORATION OF AMERICA

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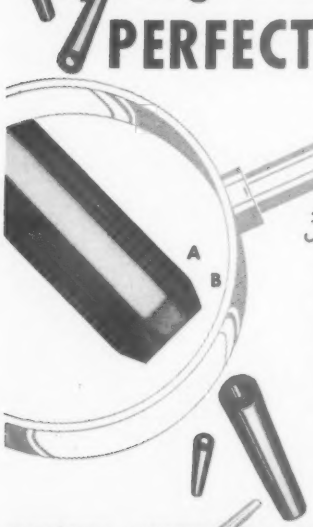
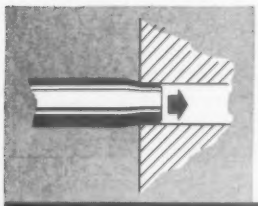
SPIROL - the spring PIN with PERFECT CHAMFER



For Smoother Insertion!

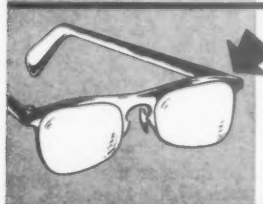
A. Smoothly rounded radius where chamfer meets shank eases insertion into hole. No sharp break to "bite" and resist insertion. **B.** Chamfer angle is precisely designed to offer minimum thrust resistance and maximum compression leverage.

OTHER UNIQUE SPIROL FEATURES



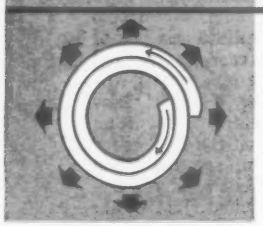
WIDER HOLE TOLERANCES

Both plus *and* minus hole tolerances are allowed because spiral construction permits greater flexibility in expansion and compression. The wider hole tolerances eliminate precision reaming requirements, reduce drilling rejects, cut costs.



MINIATURE PINS

SPIROL is the only spring type pin available in these miniature diameters: 1/32" — .039" — 3/64" — .052". Unique spiral cross-section retains flexibility and strength in smallest sizes. Other standard sizes up to 1/2" diameter.



SHOCK RESISTANCE

High resistance to shock and vibration permits use of "medium duty" SPIROL pins in a wide variety of materials with wide range of bearing loads. Heavy and light duty SPIROL pins also available in stock.

NON-HEAT-TREATED METALS can be specified in standard SPIROL pins for extra corrosion-resistance or conductivity. Less resilient metals are usable because stress is evenly distributed throughout the spiral cross-section, giving maximum spring action.

FREE! *Write for literature on Spirol Pins.*

SPIROL PIN

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Plastic clips speed . . .

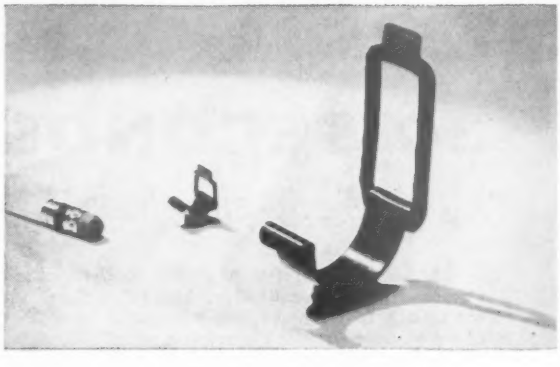
CAPACITOR ASSEMBLY

A cradle-type plastic clip fastener eliminating the need for metal case capacitors, has reduced assembly time 25% and is saving printed circuit board space for the Donner Scientific Company of Concord, Calif., producers of console and desk top analog computers.

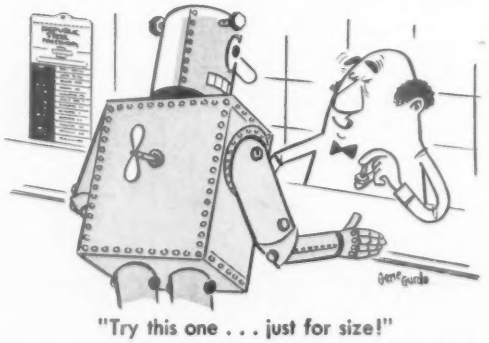
The basic component of Donner's computer is a dual DC amplifier. The console model requires 30 rivet-mounted cradles with binder clips, while the desk top model uses 10 of these nylon and Neoprene clip combinations.

"We use a 2.0 MFD. 50 V. Mylar capacitor (Goodall type 600 UE). The body of a capacitor this size in our unit must be mechanically supported. The new non-metal case capacitor costs only 35 cents as compared to about one dollar per unit for an equivalent metal case. On a capacitor basis alone, a plastic cradle-clip is the best fastening unit for us," stated Harold Novikoff, of Donner.

Between 10 and 30 various-sized cradle-type fasteners are used in each Donner computer.



BOLTS 'N NUTS FROM REPUBLIC



"Try this one . . . just for size!"

Adv. Republic Steel

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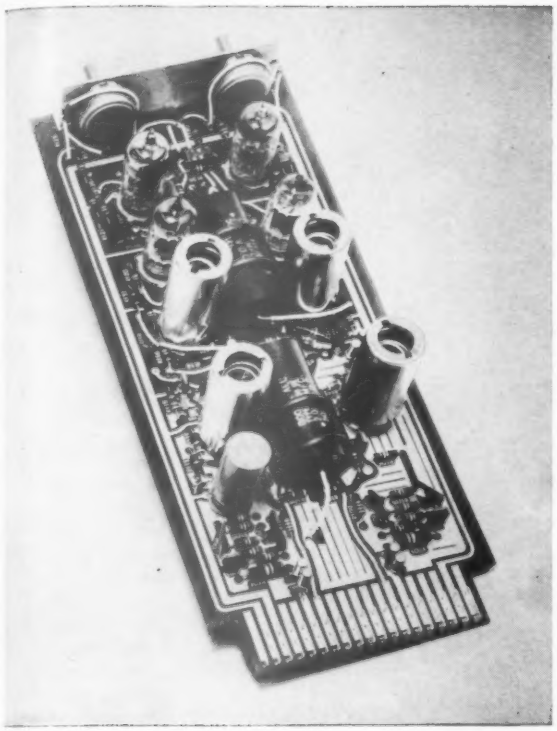

Insuloid cradle-clips, riveted to the board, hold two capacitors in place on this amplifier.

Space on the printed circuit board is used to a maximum to increase the unit's versatility. The raised base of the cradle places the capacitor body above the surface of the board, freeing space for wiring and other components. The Insuloid cradle is riveted right through a ground bus on the board, simplifying the wiring pattern by avoiding offsets.

"The obvious labor savings are in the use of semi-automatic riveting machines, which we use to place the single mounting rivet. The actual time required to cinch the capacitor into the cradle is negligible. In fact, labor costs are on a level where it is not practical to compute them on a per operation basis. We can safely say that at least a 25% reduction in labor costs results from the mounting operations alone over previous fastening methods and, in larger lots, it could well exceed 50%," said Novikoff. •

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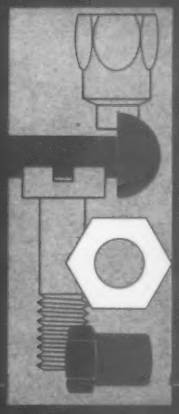

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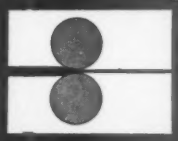

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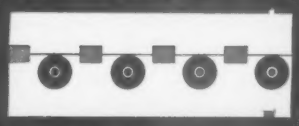

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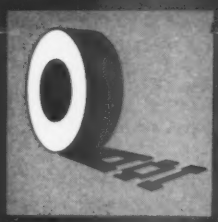

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DESIGNING FOR WIRE THREAD INSERTS

The role of wire thread inserts in assemblies subject to vibration, fatigue, impact loading

by **Harkness W. Cram**
Manager of Technical Standards
Heli-Coil Corporation

The common goal of design engineers is to develop better products at a lower cost. An important step in achieving this goal is the proper selection of materials, and the engineer is fortunate in having available today, many new materials and alloys with a wide variety of design possibilities and performance features. And where many desirable design configurations were formerly considered just beyond the engineer's solutions, these are possible today. For example, self-locking high strength threaded assemblies in lightweight materials are not usually obtained without space and weight penalties. Threaded holes in ferrous and non-ferrous metals, plastics and wood frequently require strength not inherent in the base material. In order to retain the advantages of base materials, the application of inserts with integral locking features has become widespread today.

High strength inserts offer a variety of design and performance possibilities in many materials and alloys. In soft or lightweight metals, long thread wear life is accomplished. Other advantages in various materials include high strength values, integral locking feature, as well as non-corrosive action.

The self-locking wire thread insert, for example, is being used for threaded connections in electronic equipment, aircraft, automotive and diesel engines and accessories, air frames, missiles, office and industrial machinery, railroad equipment, portable hand tools, and in other fields where thread connections are used. Manufactured of 18-8 stainless steel wire per AMS 7245 for service temperatures up to 550°F, wire thread inserts are helically-wound coils of precision-formed diamond shaped wire manufactured in standard lengths and thread sizes. "Inconel X" wire is used satisfactorily for temperatures ranging from 550° to 1200°F.

The insert incorporates a multi-sided centrally located grip coil or coils which perform as a series of "flexible beams." These cause a locking effect on the thread flanks of the bolt when the bolt is introduced into the installed insert. The threads above and below the grip coil are free-running. In use the male threaded member displaces the chords of the grip coil. The resulting prevailing torque causes a locking effect on the male member.

The resulting assembly resists vibration, fatigue and impact loading. The insert itself has a high reusability factor and any wear that may occur takes place on the bolt. Simplicity of design can be achieved because the locking device is contained in the tapped hole.

A tang on the end of the first entering coil of the insert serves as a driving member. Each tank is notched so that it may be broken off after installation so as not to interfere with passage of the screw through the insert.

As shown in Figure 1, the three basic components of wire type insert assemblies are (1) cap screw, (2) a locking wire thread insert, and (3) a tapped blind or through hole.

Self-locking inserts are "designed-into" steel parent materials, principally to resist the effects of vibration. For example, adjustment screw assemblies can be provided that will not vibrate loose and disturb pre-set conditions. Typical applications include adjustments on fuel metering devices, control valves, electronic instruments, weighing scales and other control items.

continued

In addition to providing a self-locking connection, wire thread inserts can be used in aluminum, magnesium and non-metallic materials where deterioration of threads may be caused by repeated disassembly and reassembly or excessive vibration and loading. In such cases, the stronger threads provided by inserts can be used where space restrictions do not allow sufficient thread engagement or the use of a larger screw size. Under a wide range of temperature conditions, the flexibility of the wire enables the insert to contract and expand in the parent material.

With an effective internal locking device it is also possible to design improved lock-nuts and special fasteners. The inserts can be used to advantage in blind hole connections where conventional lock-nuts can not be used.

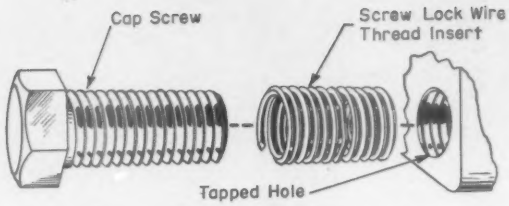
In designing a new product, the engineer uses standard reference data to determine whether the size of the threaded connection selected can safely withstand the known tensile, torque, vibration and fatigue loading. To obtain the full value of the connection when using wire thread inserts, he retains the same screw sizes and conventional diameters for newly designed equipment or re-designed assemblies on older equipment.

These inserts also provide threaded connections that will realize the full value of the screw when conventional proportions of length of thread engagement are used. Therefore, when these inserts are used to prevent thread wear, standard flange thicknesses may be specified at the initial stage of design and the added thread strength provided by the insert may be considered as an additional safety factor. However, when inserts are specified for the purpose of providing stronger threads in critical applications, conventionally proportioned connections can be modified to meet engineering requirements. Provision should be made to assure sufficient thread length on the bolt to provide adequate thread engagement with the insert. This is required to support the load on the bolt as called for in the design details.

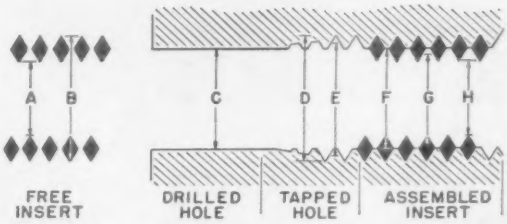
LENGTH OF THREAD ENGAGEMENT

Recommended lengths of thread engagement, when wire inserts are specified to prevent wear or deterioration of threads in either blind or through holes, agree with conventional engineering practice and insure strip-proof female threads when sufficient wrench torque or tensile load is applied to break the screw.

When inserts are used with high tensile strength bolts to provide additional thread strength, length of the insert depends on loading requirements. Special insert lengths as well as special locking torque requirements can be provided for special applications. When screw-lock inserts are designed in an assembly, it is necessary to specify proper type and length of bolts to obtain sufficient thread engagement with the locking coil.



1. Basic components of a wire-type insert assembly.



2. Of dimensional data on standard wire inserts, the minor diameter (c) of the drilled hole and the pitch diameter (e) of the tapped hole are the only dimensions required in specification drawings.

Self-locking wire thread inserts can be used in conventionally proportioned bosses in which no provision has been made for bushings. Standard practice in specifying boss diameter or edge distance can usually be applied since the increase in major diameter of the tapped hole to receive the wire insert is small.

Dimensional data in both hole diameter and depth is available for all standard wire insert sizes (Figure 2). Although such data is given to help the engineer in specifying diameter dimensions, the minor diameter (C) of the drilled hole and pitch diameter (E) of the tapped hole are the only dimensions required in specification drawings. The inserts have been designed so that when the dimensions of the drilled and tapped holes are maintained within the minimum and maximum values given, the dimensions of the insert assembly will match the screw size and class of fit selected. The minor diameter of the drilled hole (C), for example, is engineered to provide the necessary depth of thread or flank engagement. Standard shop practice is followed for using screw thread insert taps and gages. To insure the specific class of fit it is important that the proper drill, tap and gage size be selected with care.

Depth dimensions usually require attention both in specification by the designer and in assembly of the inserts. Four basic types of threaded holes should be considered when specifiying depth dimensions for self-locking wire thread inserts: production blind holes, production through holes, minimum blind holes, and minimum through holes.

PRODUCTION BLIND AND THROUGH HOLES

The production blind and through holes in Figure 3 represent a common condition in which there is sufficient depth of material to permit usual produc-

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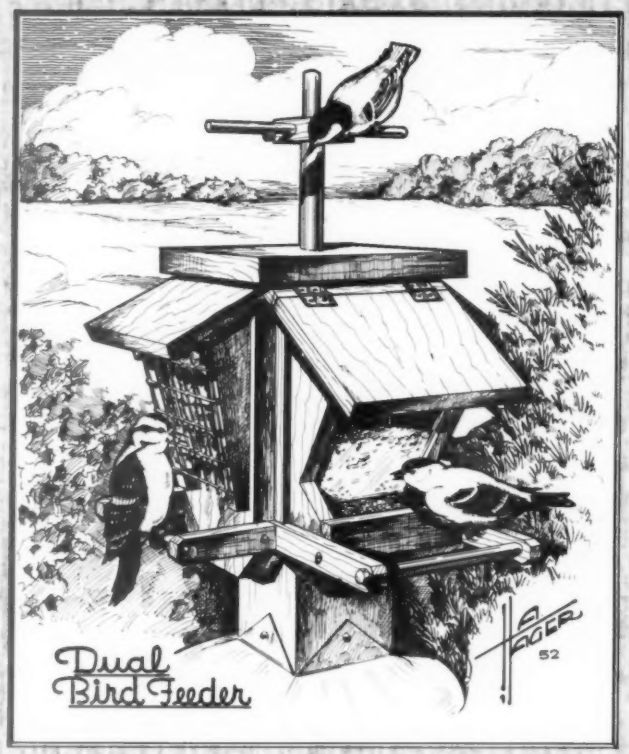

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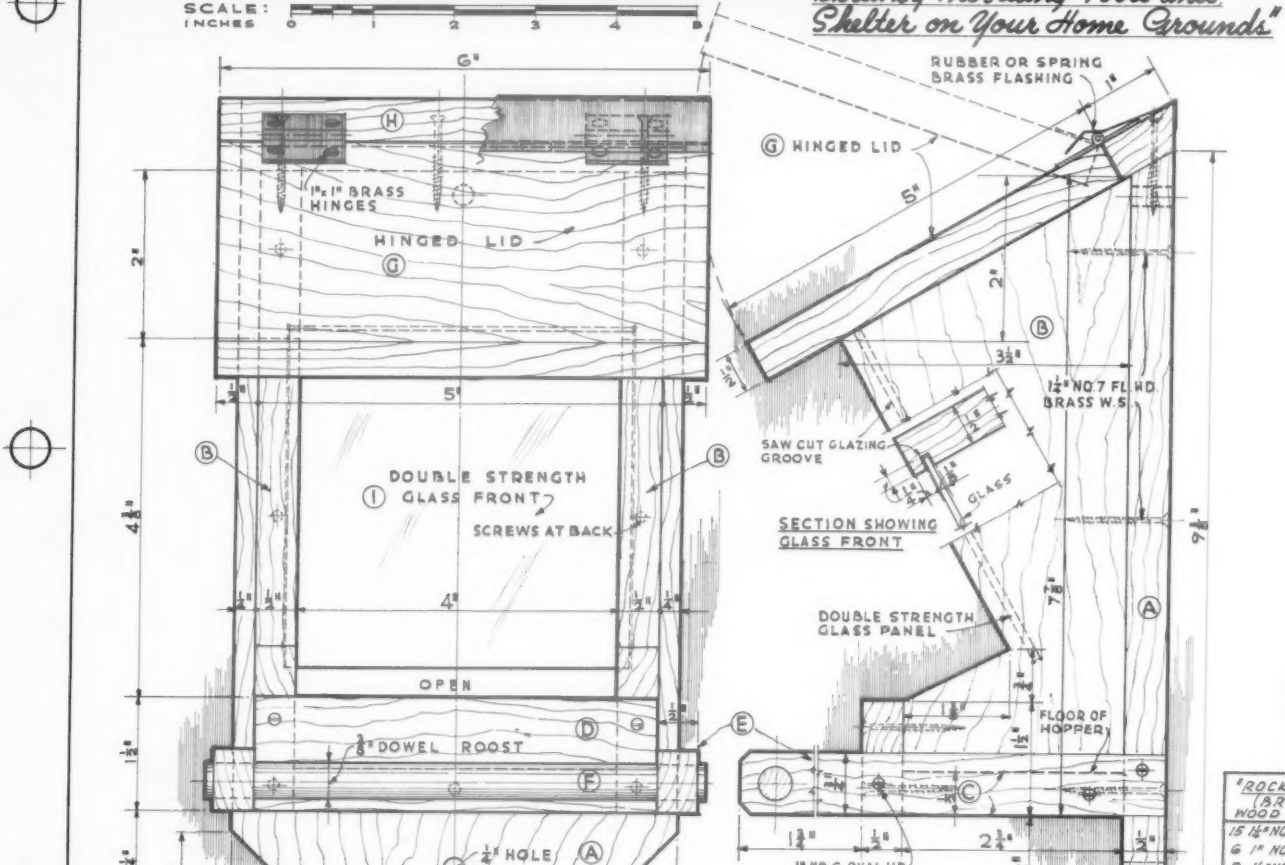

"ROCK (B.R. WOOD
15 1/2" NO
6 1" NO
2 1/2" NO (WI

"MI
1 PR 1/8" M
1 PC 2 1/2" G SPRING B

G-9-52 HAGER DESIGN STUDIO

BIRD LURE:

- *Friends*: MANY OF YOU HAVE BUILT THE SUET FEEDER WHICH APPEARED IN THE JAN. 1960 "HOBBY-NEERING" AS PROJECT NO.11 SERIES NO.9 AND I FIND IT PROPER THAT A MATCHING SEED FEEDER IS IN ORDER TO COMPLETE THE COMBINATION AS I HAVE ILLUSTRATED IT ON THE COVER PICTURE OF THIS ISSUE. SO GET YOUR JAN. 1960 ISSUE AND GET BUSY.
- IN THE EVENT YOU DON'T HAVE IT SEND ME $1.00 AND I WILL SEND YOU 2 (21" x 14") BLUE PRINTS OF THE SUET FEEDER & POST DRAWINGS.
- IT IS IMPORTANT THAT WE PROTECT OUR VALUABLE SONG BIRDS AND ENCOURAGE THEM TO OUR GARDENS BY PROVIDING NESTING BOXES FEEDERS AND A BIRD BATH.
- I HAVE HAD SOME NICE REPORTS OF THE SUCCESS SOME HAVE HAD IN BUILDING THE MARTIN HOUSE FEATURED LAST FEBRUARY. SOME HOUSES WERE QUICKLY OCCUPIED TOO.
- NOW LET US GET BUSY ON THE SEED FEEDER IT IS REALLY VERY SIMPLE TO MAKE SO CUT OUT TWO WHILE YOU ARE AT IT.
- RED CEDAR IS WHAT I USE AND PREFER IN BUILDING THIS TYPE OF PROJECT ALTHO ANY SOFT WOOD WILL DO.
- PUTTING TWO SEED FEEDERS AND TWO SUET FEEDERS BACK TO BACK & FASTENING THEM TO A 4" x 4" POST 5'0" FROM THE GROUND MAKE AN IDEAL COMBINATION. WILD BIRD SEED MIXTURE IS AVAILABLE AT MOST FEED OR PET STORES.

(SEND ORDERS FOR EXTRA DRAWINGS TO ME:

Herman A. Hager
3712 Halsted Road, Rockford, Ill.

Bill of Materials

A	1 PC.	½" x 5½" x 9¼8"	BACK
B	2 PCS	½" x 3½" x 7⅞"	SIDES
C	1 PC.	½" x 4" x 2¾4"	FLOOR
D	1 "	½" x 5" x 1½"	FRONT
E	2 PCS	½" x ¾4" x 5½"	CLEATS
F	1 PC.	⅜" x 6½"	PERCH
G	1 "	½" x 5" x 6"	LID
H	1 "	½" x 1" x 6"	HINGE STRIP
I	1 "	4⅛" x 4⅞"	D.S. GLASS

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S 1¼" NO 7 FL. HD.
1" NO 6 OVAL HD.
1¼" NO 8 RD. " (WITH WASHERS)

"MISC."
PR. 1½" BRASS HINGES
2½" x 6" RUBBER OR SPRING BRASS FLASHING

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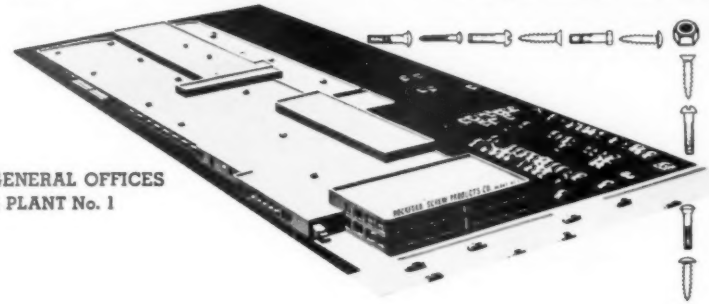
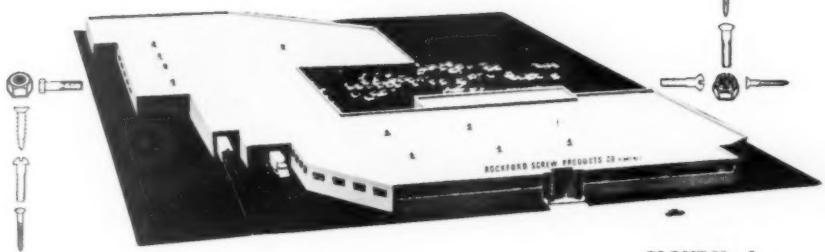
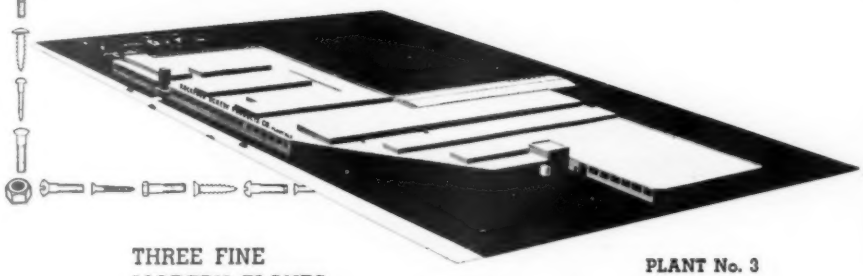


GENERAL OFFICES
& PLANT No. 1



PLANT No. 2



PLANT No. 3

THREE FINE
MODERN PLANTS
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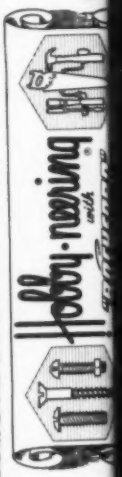


"ROCKFORD" ®
HOME WORKSHOP
PROJECT of the

tion tolerances in drilling, countersinking, tapping and locating the insert below the hole surface. Provision is made for the insert to be installed from ¾ pitch to 1¾ pitches below the surface with sufficient tolerance that the insert may be properly seated by hand or power equipment.

Note that the ends of the two cap screws in production blind holes are separated from the tangs by at least one thread pitch. This gap occurs because the inserts shown have been installed to the maximum depth of 1¾ pitches below the surface. If these inserts had been installed at the minimum depth of ¾ pitch, the bottom of the cap screw would be almost touching the tang. Thus, the dimensional specifications in Figure 3 for the ¼-28 nominal thread size allow for the indicated variation in installation depth.

Where countersinks are used they should have a 120-degree included angle to facilitate assembly of the insert into the tapped hole. The 120° included angle matches the profile of the tapped threads and the insert is then permitted to slide down the surface of the countersink into the first threads during insertion.

The drilled hole may be threaded with either a plug style tap or a bottoming style tap. Because the plug style tap requires 3½ pitches of chamfer and the bottoming style tap requires only 1½ pitches of chamfer, the bottoming style tap requires two less pitches in drilling and tapping depths. This saving of two thread pitches in depth, however, is critical where the minimum blind hole depth must be achieved.

MINIMUM BLIND AND THROUGH HOLES

For minimum through holes (Figure 4), the wire thread inserts have been engineered so that standard increments of insert lengths may be used in flanges with a thickness equal to the nominal insert length. The holes are not countersunk. The ¼-28 x 1 diameter wire thread insert in the example will fit properly into a ¼" thick flange without a countersink included. Clearance for locating the coil below the boss surfaces is obtained because the maximum assembled length of the insert is ½ pitch short of ¼ in.

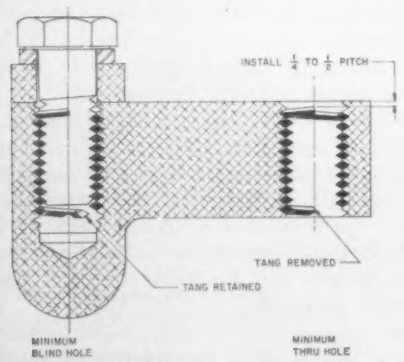
In Figure 4, in order to save as much flange depth as possible in a minimum blind or through hole, the insert must be installed from ¼ to ½ pitch deep, thereby requiring 1¼ pitch less depth than the production blind or through hole. The smaller range of installation depth (¼ pitch) requires careful assembly of the insert, but may be necessary for proper over-all assembly in critical cases where weight and space are of prime importance, such as in missile applications.

The end of the cap screw in the minimum blind hole is closer to the tang than in the production blind hole because the smaller depth range in assembly requires less allowance for variation above the tang. The drawing in Figure 4 shows a bottoming tapped hole in order to save the depth of two pitches.

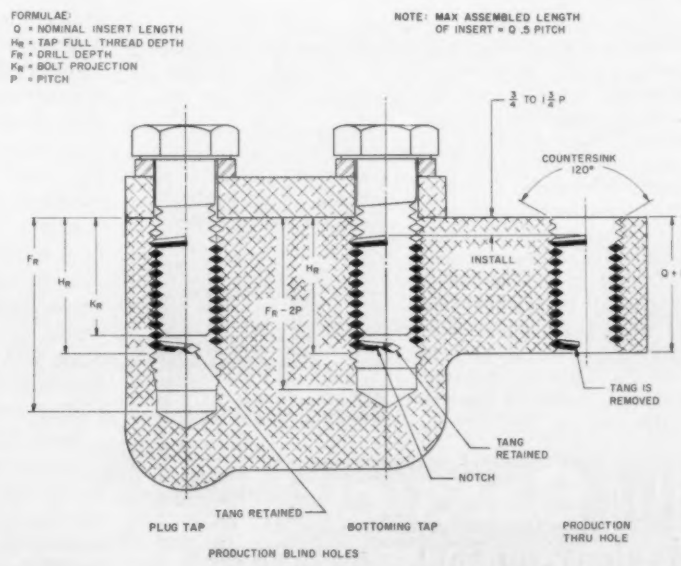
While a power tool is most economical for large production quantities, power inserting tools and feed units have been developed for use with automated high volume assembly lines.

In selecting the proper length of cap screw or bolt, the designer should consider the maximum and minimum dimensions of the attaching flanges and washers and other mating parts. The maximum flange and washer thicknesses must be known in order to select a bolt or cap screw long enough to insure sufficient thread engagement with the insert. For proper locking effect a bolt used with the locking insert must extend at least one full thread beyond the gripping coil. •

3. At the right are examples of wire thread inserts used in both production blind and through holes.



4. Here are examples of the wire thread inserts used in minimum blind and through holes.



Notice how specially designed strike, base and link have been adapted to gear mechanism. Ask for GEAR-LOCK clamp GL-101.

For mounting on flat surfaces. Ask for Hook type clamp HR-1.

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Design Factors in . . .

CHOOSING A PROPER BOLT

by **Francis R. Kull**
Engineer, Special Assignments
Standard Pressed Steel Company

A designer faced with the problem of choosing the proper bolt for a given job must consider many factors before he can make a final decision. Amount of working load, type of load, materials, weight, corrosion, temperature and cost are some of the more important items.

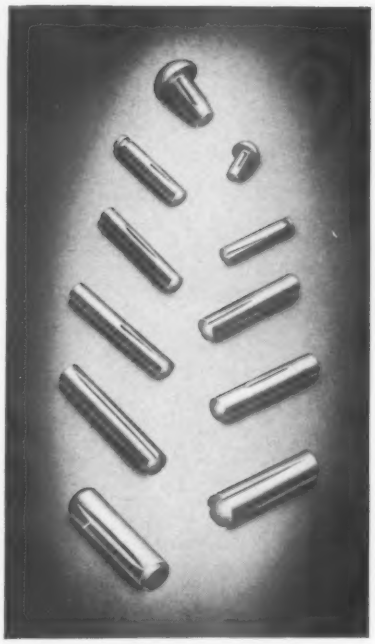
When the designer evaluates the amount of load a section of the machine will impose on a bolt, it is normally called the working load. To this load which is calculated or estimated, the designer adds an additional amount of load called a safety margin. This safety margin allows for errors in calculation or any other uncertainties that may exist in either the machine or the fastener, and means that he is allowing a reserve amount of load over and above the normal load the bolt is expected to carry. Combining the working load and the safety margin then sets a total value on the necessary strength of the bolt required for the design.

Suppose the necessary fastener tensile strength is 5700 pounds. Then the choice of a medium carbon steel bolt of the hexagon head variety will necessitate a 5/16 diameter. If a high strength socket head screw is used, a ¼" diameter will do the job. If one of the ultra high strength fasteners now being developed is used, only a 3/16 diameter will be required!

In comparing each of these bolts, however, we have used tensile strength only. Fatigue strength, which is very important, will be much greater in the smallest fastener. It is also evident that a great difference in weight exists between each of the mentioned sizes. Weight is very important to an aircraft designer so he would choose the smaller bolt. A design involving bulky and low cost equipment could justify the use of the large bolt, but the trend is definitely toward lighter and stronger machines and higher strength fasteners.

Higher strength bolting also means that fewer bolts can be used in a design just as well as being able to reduce the size of the bolts. For instance, three high strength socket head cap screws can easily do the work of five ordinary bolts of the same size. Drilling and tapping fewer holes and more compact design are also a direct result of using higher strength fasteners.

Remember, the one factor which contributes most to satisfactory bolt usage is the ability to develop a sufficient clamping force—or preload— by tightening the bolt. Even when the greatest amount of care is used in choosing a proper bolt, improper tightening techniques will result in poor performance. •



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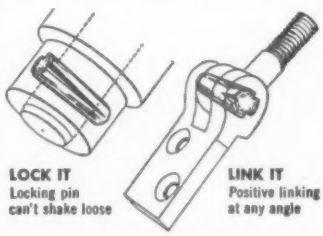
Groov-Pins are made to meet your requirements, too. Standard sizes run from 1/32 to 1/2", specials to fit your needs at standard prices over 5,000 pieces. Send for illustrated catalog, free samples.



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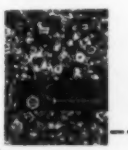

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WHAT'S NEW IN EQUIPMENT

For information on any equipment listed here, use the postpaid card opposite page 74. Just circle the number on the card matching the number following the description. We'll do the rest.

(See 2)

SMALL PARTS ASSEMBLY BY VACUUM HAND TOOL

Assembly of delicate parts is done by vacuum, with a transducer providing vacuum wherever there is compressed air.

The Bazooka Vacuum Probe eliminates pinching or nicking. Parts can be inspected because vacuum provides uniform pressure which can be adjusted by changing plastic tips within a wide range.

The Air-Vac Engineering Co., Old Stratford Rd., Box 27, Shelton, Conn.

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(See 1)

ADD 4000 FT.-LB. GEARED WRENCH, SOCKET WRENCHES

A 4000 ft.-lb. model has been added to a line of geared head wrenches (torque multipliers). At the same time, a line of larger socket wrenches has been developed.

The TD-1500 wrench has a 1" input drive and 1½" output drive and fills out the torque range of the line from several hundred ft.-lbs. to 4000 ft.-lbs.

Socket wrenches can be produced from 1½" to 8" or larger without special tooling and in increments of a few thousandths of an inch when specified.

The X-4 Corp., Box 1148, West Acton, Massachusetts.

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(See 3)

HEAVY-DUTY AIR RIVETER FOR MULTI-HEAD JOBS

A pneumatic rivet machine, for heavy-duty applications, is especially suited to multi-head or "cluster" installations. The Model 57 sets semi-tubular, full tubular or bifurcated rivets ranging from ⅛" diameter x ⅛" long to 3/16" diameter x 1" long.

Several heads may be grouped on a single base and combined with slide fixtures or transfer tables, as one production unit adaptable to automatic cycling. Maximum cycling speed is governed only by the rate at which rivets feed into the jaws. Stroke speed is readily adjustable to control impact when fragile materials, such as plastics or ceramics, are being assembled. The Model 57 is connected directly to a shop air outlet when used individually on bench or pedestal mounts; when used in multiples, the heads are connected to a common manifold.

Although the new unit offers a 3" stroke and 12" throat depth, its overall size has been held to 33" high by 23¼" deep. The tapered nose construction and narrow, 5" wide across section permits setting rivets on varying centers down to 1".

Milford Rivet & Machine Co., Milford, Connecticut.

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FASTENER SLIDE CHART GIVES A-N DIMENSIONS

One move of a slide chart based on the AN Aeronautical standards will give all the important dimensions of such fasteners as bolts, screws, nuts, washers, lockwashers and screw thread dimensions. Dimensions for bolt sizes No. 0 to 1¼" are given.

Elemoto Sales Co., 305 8th Ave., Belmar, New Jersey.

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PASTE SOLDER ALLOY WITH ACTIVATED ROSIN FLUX

A paste solder alloy containing an activated rosin flux is designed for electronic component soldering. It is specified where neutral rosin-type fluxes are too inactive, yet where non-corrosive, non-conductive residues are needed.

The AR series solder is slightly active before soldering, tests neutral after soldering. Activity is measured in chloride content in parts per million.

Fusion Engineering, 17921 Roseland Ave., Cleveland 12, Ohio.

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ADHESIVE FEATURES FAST GRAB, LONG OPEN TIME

A general purpose adhesive combines fast grab and long open time characteristics suitable for firm bonding of fabrics, leathers and insulation to woods, metals and glass.

Typical bonding operations for which the adhesive, identified as Rez-n-Glue No. 218, include bonding of: fabric to steel; felts to steel; rubber mats to steel and cloth-backed vinyls to steel. The product is a high solids type, reclaim rubber base, red adhesive, con-

forming to the requirements of specification MIL-A-101A.

Schwartz Chemical Co., Inc., 50-01 2nd Ave., Long Island City 1, N.Y.

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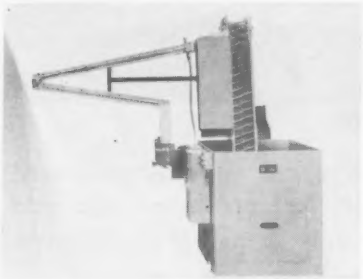
TRANSFER EQUIPMENT FOR HOPPER FEED



Added to the Model 4000 elevating hopper feed is a transfer mechanism to change the position of parts from a rolling to an end-to-end position. Rate of feed ranges from 0 to 400 parts per minute.

Thickness and diameter range gives adaptability to varying sizes of rolling parts. With different tooling cylindrical or headed pieces can be handled. Hopper capacities are 7½ or 12 cubic feet. Elevating heights can be varied.

Production Feeder Corporation, 3130 Johnnycake Ridge Road, Mentor, Ohio.

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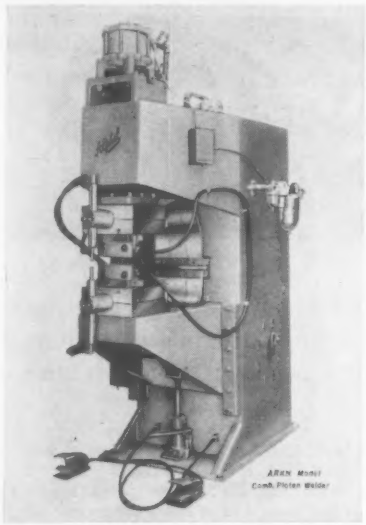
COMBINATION SPOT AND PROJECTION WELDER



Designed for the sheet-metal, wrought-iron and wire fabricating industries, a combination spot and projection welder, Model ARKN, features combination large platten and standard arm arrangement, flexibility for die mounting, roller-bearing ram, high speed, and ruggedness.

Easy up-and-down adjustment of the lower extension arm is provided by a hydraulic jack. The lower extension arm permits great pressures without deflection. The platten bed is made of high electrolytic bronze. The welder also has a self-adjusting pressure switch to maintain sure pressure firing. It is available in capacities from 50 to 200.

Alphil Spot Welder Mfg. Corp., 1058 Pacific St., Brooklyn 46, N.Y.

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UNIT MEASURES, RECORDS WELD FLOW, VOLTS

Apparatus for measuring and recording current flow and voltage on the primary side of resistance welding machines enables the set-up man to regulate the output of the machine to get optimum welding.

The instrumentation consists of a split-core toroidal coil, a current transformer, a potential transformer and a dual-channel magnetic oscillograph.

In use, the coil is clamped around an incoming power line on the primary

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If your operation involves the manufacture or processing of parts in volume quantities, it will pay you to investigate the cost saving advantages of Feedmatic automated equipment. *Send us your problem today!*

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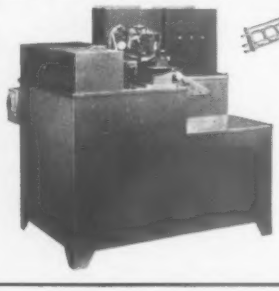
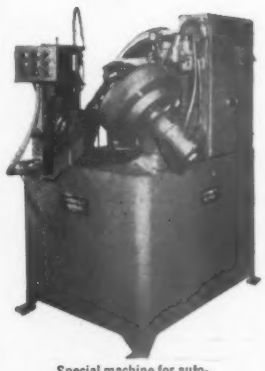
Automatic Gaging Machine measures and sorts parts. Adjustable stops, anvils and gage heads to facilitate change over to different size parts. Tolerance of electrical gages adjustable from .0005 to .020.

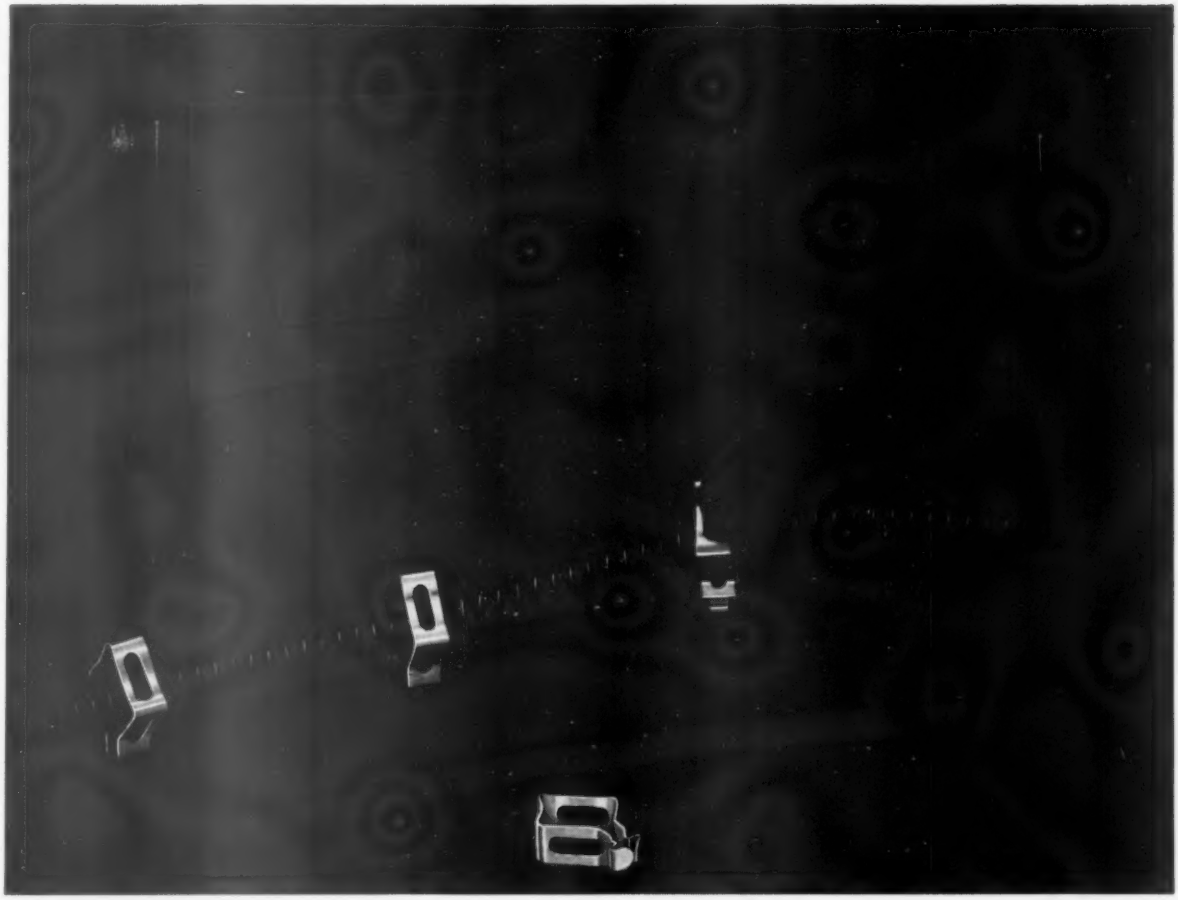


Model 12F Floor Hopper. Parts storage capacity, 12 cubic feet. For automatic feeding of larger parts.

Rotary hopper unit. Fast, efficient parts feeding. Available in sizes from 8" to 24". Feed tracks engineered to meet specific job conditions.



Special machine for automatically assembling automotive components.



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You can call Mellowes *"collect" long distance* any time to place an order. The next time you need lock washers in a hurry, phone Mellowes "collect."

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To get your lock washers to you as quickly as possible, Mellowes always ships via fast transportation.

Remember, too, that Mellowes pre-pays the freight on all shipments of 200 lbs. or more, a practice which eliminates time-consuming detail work in *your* office. Consider it!

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side of the welding transformer and two posts of the potential transformer are connected across the primary winding. The unit records magnitude of current flow, the voltage and number of cycles. It also shows the time relationship between them.

Control Devices, Inc., 925 S. Eton Rd., Birmingham, Michigan.

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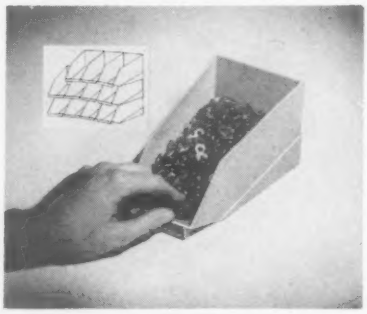
PLASTIC PARTS BIN IDEAL FOR STACKING



A lightweight, high impact, molded plastic bin for small parts assembly is 8" long, 3¼" wide and 2½" high.

Individual bins can be stacked, tapered fronts permitting a semi-circle setup. Sloping bottoms provide a natural forward flow of parts.

Stackbin Corp., 1155 Main St., Pawtucket, Rhode Island.

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SWIVEL JAW NUT SPLITTER CRACKS TOUGH NUTS

Stubborn "frozen" and rusty nuts can be reached, split, and removed with the HKP Swivel Jaw Nut Splitter designed to cut nuts up to, and including, ⅞" across flats.

To operate, the swivel blade is placed against the side of the nut, the power screw is turned by hand until the jaw is tight against the nut, and then tightened with a hand or power wrench until enough pressure is applied to split the nut. The tool will not damage the bolt from which the nut is removed.

H. K. Porter, Inc., 74 Foley St., Somerville 43, Massachusetts.

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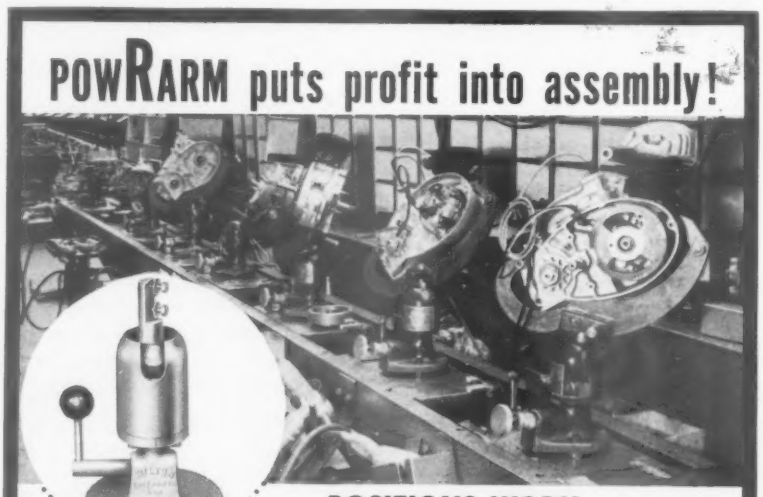
POWRARM puts profit into assembly!



. . . POSITIONS WORK, LEAVES BOTH HANDS FREE!

Hands that hold work pieces are non-productive. Versatile Wilton PowRarms position work to any angle in three planes, and leave both hands free. This conveyorized assembly line at Power Products, Grafton, Wis., has paid for itself many times. Five manual and automatic models, for conveyor or bench mounting. PowRarms never become obsolete, cost less than custom fixtures. Write for information today!

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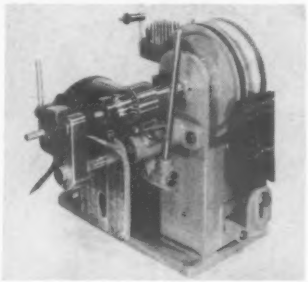
HAND-FED POWER THREADER FOR SENSITIVE WORK



A hand-fed power threader taps holes, cuts external threads and performs other common drill press operations in metal or plastics.

All work is hand fed, which enables the operator to feel strain. The use of Sensi-Threader on experimental runs, or on delicate threading and tapping jobs is said to eliminate most tap breakage, loss of operator time, and rejection of parts from this cause. It can also be adapted for fast assembly work with a spindle non-reversing attachment. Operating speed is approximately 700 r.p.m.

Three models vary only in capacity. Model B taps up to ¼" in steel, Model D to 5/16" in steel, and Model F to½" in steel.

Sensi-Threader Sales Co., 4820 49th Ave., S.W., Seattle 16, Wash.

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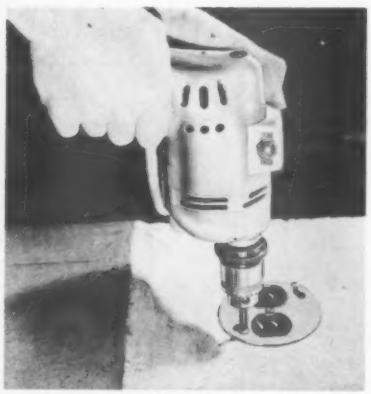
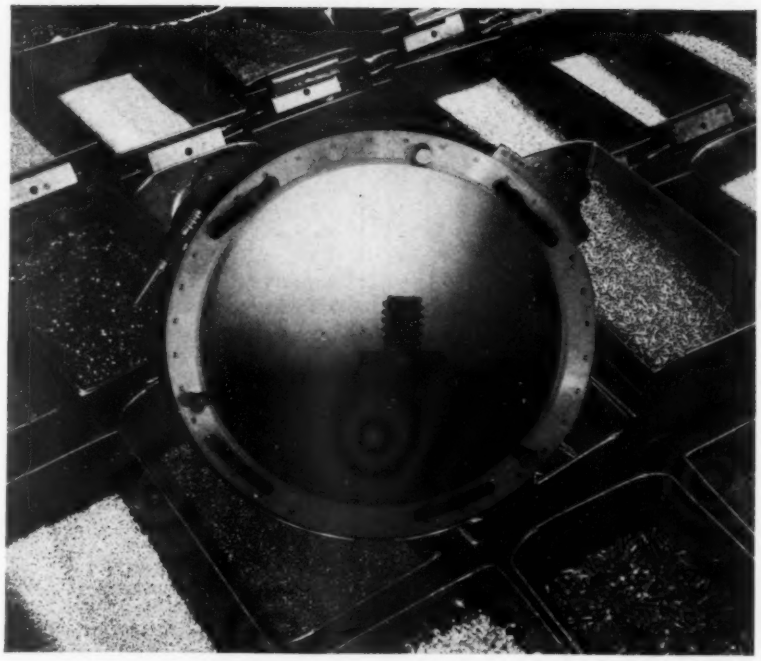
POWER TOOL IS BOTH SCREWDRIVER, DRILL

A tool combines the properties of a drill and power screwdriver in a single, hand-held unit.

As a drill the Scru-Drill can be used with all kinds of bits, including twist drills up to ⅜", wood augers to ¾", masonry bits up to ½" and hole saws from ⅝ to 1¾".



A turn of the spindle collar on the tool converts it to a practical equivalent of the Scrugun, with a true screwdriving clutch. The bit idles for finding the screwhead slot, then forward pressure of the tool engages the mechanism and drives the screw. As soon as the screw is properly seated



HUBBELL FASTENERS PASS INSPECTION AT 7 QUALITY CONTROL STATIONS

When a shipment of Hubbell fasteners leaves our Hubbell plant, everything humanly possible has been done to make those fasteners perfect in every respect. Here are the seven quality control stations that make every Hubbell fastener a finished precision product.

1. Raw materials inspected, dimensions checked, alloys tested.
2. Cold heading of blanks tested for material, quality and size accuracy. Blanks are tumbled to remove burrs and chemically cleaned.
3. After slotting, blanks are inspected for quality of cut and depth and width of slot; also for dimensional accuracy. Fasteners are again tumbled to remove slotting burrs and chemically cleaned.
4. Thread rolling operation precision checked for accuracy and fasteners chemically cleaned.
5. Secondary operations checked for dimensional accuracy and workmanship. Again chemically cleaned.
6. Plating operations checked to insure compliance with required specifications.
7. Orders inspected for quality and cleanliness prior to shipment to be sure no foreign matter is included that might jam automatic feeds. Sturdy, weatherproof containers sealed for shipment.

This quality can be your greatest production economy. For standards or specials, call Bridgeport, EDison 3-1181.

IT PAYS TO HAVE HUBBELL GOOD CONNECTIONS

Quality FASTENERS

HARVEY HUBBELL, INCORPORATED
Machine Screw Department, Bridgeport 2, Connecticut

See the Hubbell Fastener Catalog in Sweet's Product Design File 7/Hu.

Use postpaid card. Circle No. 243

Get Rocket-Fast Shipment from world's largest STOCK of Stainless Steel Fasteners

No long countdowns here. Allmetal stainless fasteners are stockpiled in advance—ready to go on your order. Fasteners in Commercial, AN, MS specs. You get fast delivery, precision quality, plus mass production economy when buying direct from stock.

Special fasteners also fabricated to your exact requirements on extremely short notice. Full range of raw materials assures prompt service. Simply send blueprint or specifications.

Pins • Bolts • Nuts • Screws (including slotted and Phillips—magnetic and non-magnetic) • Washers • Cotters • Rivets • Rods • Studs • etc.

PHONE OR WRITE for prompt quotation or shipment. Send for catalog.

ALLMETAL®

SCREW PRODUCTS COMPANY, INC.

Manufacturers of Stainless Fasteners Since 1929

821 Stewart Avenue, Garden City, L.I., N.Y.
Phone: Pioneer 1-1200 TWX GCY 603

Midwest Division
6424 W. Belmont Avenue, Chicago 34, Illinois
Phone: AVenue 2-3232 TWX CG 3185

West Coast Division—Office and Warehouse
5822 West Washington Blvd., Culver City, Calif.
Phone: WEbster 3-9595 TWX LA 1472

Use postpaid card. Circle No. 244

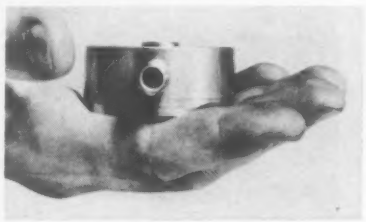
release of driving pressure disengages the clutch, halting the drive and helping prevent any marring of the work surface.

The drill also can be used for running up nuts by using shanks and sockets. A special feature is the reversing switch which permits quick removal of screws or nuts in disassembly operations.

Black & Decker Mfg. Co., Towson, Maryland.

Use postpaid card. Circle No. 13

AIR CYLINDERS DESIGNED TO SAVE SPACE

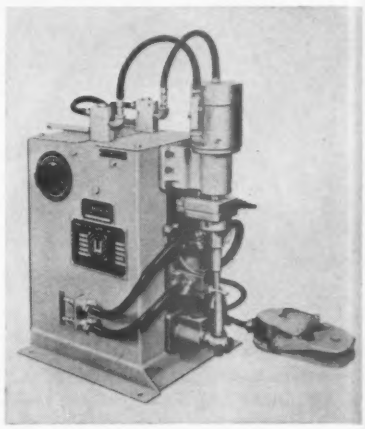


An innovation in the space-saving concept of air cylinder manufacture is the Pancake line of low pressure air cylinders permitting utilization of air power within space limitations which, up to now, precluded its use. The air cylinders are being offered in pressure ratios ranging from 1:1 (line pressure) to three times line pressure and with strokes from .010" to 1".

Fabco, 1231 Main Ave., Cleveland 13, Ohio.

Use postpaid card. Circle No. 14

PRESS-TYPE BENCH WELDER FOR EXTRA FINE WORK



A small press-type bench welder designed for extra fine and critical welding brings a higher capacity and a wider work range to the same type of fast, sensitive and automatic operation which hitherto has been the special field of the tweezer type and miniature press welders.

Produced in models with capacities ranging from 5 to 50 kva, the machine is air actuated, has adjustable upper and lower arms and holders, and comes equipped with a foot switch. A light-metal ram operating in a lineal ball bearing sleeve and a precision diaphragm cylinder help to give the ma-

Every screw machine man NEEDS this basic thread data....

VOL. V THE EASTERN MACHINE SCREW CORPORATION, 140 TRUMAN ST., NEW HAVEN, CONNECTICUT NO. 1
UNIFIED AND AMERICAN NATIONAL SCREW THREAD DATA
COMMENTS BY THE EASTERN MACHINE SCREW CORPORATION
GET YOUR COPY free!

Thread forms of Canada, Great Britain and United States . . . Unified and standardized . . . Major, minor and pitch diameters with tolerances . . . Over 600 internal and external threads. Your name and address on the margin is all we need

THE EASTERN MACHINE SCREW CORPORATION • 28-48 Barclay Street New Haven, Conn.

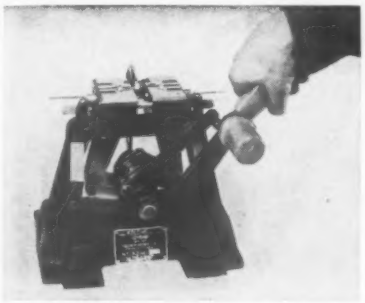
Use postpaid card. Circle No. 245

chine its special adaptability for critical welding.

Universal Electroweld Division, Electric Arc, Inc., 152-1 Jelliff Ave., Newark 8, New Jersey.

Use postpaid card. Circle No. 15

MANUAL BENCH TOOL FOR COLD PRESSURE WELDING



A hand-operated bench model tool for cold pressure welding requires no current, heat or fluxes. The manufacturer states that the physical and electrical properties of the joint are equal to that of the parent metal.

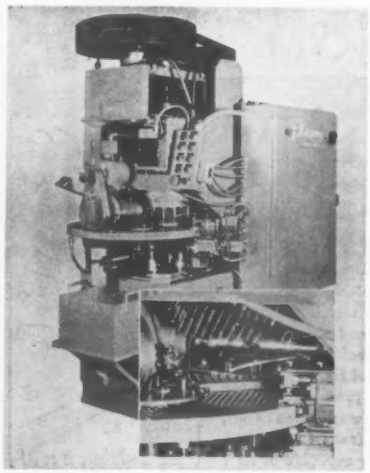
The KBM-1 will handle from No. 18 AWG (.040") to No. 8 AWG (.128") aluminum wire and from No. 18 AWG to No. 9 AWG (.114") copper wire. Some brasses, lead, zinc, nickel, silver, palladium, platinum, gold and tantalum wires have been buttwelded to themselves and each other. Formex and enamel coated wire can be welded without removal of coating.

The KBM-1 is supplied with a rapid die-changing instrument which can also be used for extra die storage.

Koldweld Division, The Kelsey-Hayes Co., Utica 4, N.Y.

Use postpaid card. Circle No. 16

NUT TAPPING MACHINE WITH LEAD SCREW CONTROL



Equipment will tap up to 50,000 nuts per hour, accommodating nuts ranging in pitch from 8-32 through ⅛". The machine also features lead screw control of the head with all taps rotating simultaneously.

Nuts are hopper-fed to one of six sections of a circular feed-index plate

100,000 Washer Dies
at your disposal

In the purchase of special washers to meet your specific requirements, an important item of initial expense is *die cost.* In addition, the time factor that enters into the designing and building of special dies to conform to your blue prints can prove costly in terms of curtailed production of the equipment on which the washers are to be used.

Here at our Milwaukee Wrot Washer Plant we have available what we honestly believe to be the world's largest inventory of Washer Dies . . . *more than 100,000 different* dies covering almost every conceivable type of washer. These dies, accumulated over a period of 70 years, are at your disposal *without cost* . . . ready for immediate production of washers in all classifications covered by this methodically indexed die inventory.

Whether you are in need of Standard or Special Washers . . . any type, any size, any material . . . consider Wrought Washer Mfg. Co. your No. 1 Source. We can also take care of your requirements for all kinds of stampings.

Write for your free copy of our new Catalog No. 40-B.

Send us your specifications and let us quote on your requirements for washers and stampings of every kind.

WROUGHT WASHER MFG. CO.
2195 S. BAY STREET
MILWAUKEE 7, WISCONSIN

The World's Largest Producer of Washers

65-B716

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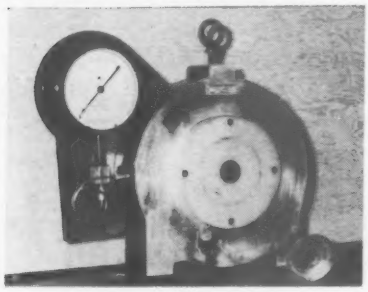
and brushed so that they are positioned flush with the top of the locator plate. The nuts are then oriented in locator holes, locked in the plate, tapped and discharged.

Zagar, Inc., 23900 Lakeland Blvd., Cleveland 23, Ohio.

Use postpaid card. Circle No. 17

CALIBRATOR TENSILE TESTS LARGE DIAMETER BOLTS



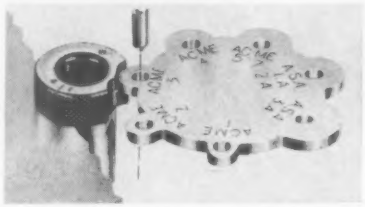
A precision calibrating unit, designed to test tensile of larger diameter bolts and studs, measures bolt loads up to 225,000 lbs. The Model K may be used with bolts and studs up to 2½" in diameter.

The new calibrator permits measuring of bolt loads in ranges not before possible. It is portable, direct reading, self-contained, and certified accurate within 2%.

Skidmore-Wilhelm Mfg. Co., 442 Green Rd., Cleveland 21, Ohio.

Use postpaid card. Circle No. 18

PLASTIC LOCATING JIG FOR A.S.A. LOCK SCREWS



A plastic jig is used for location in the drilling and tapping of A.S.A. lock screws. The proper radius is fitted into the milling of a slip fit bushing and the exact location for drilling and tapping is then provided by the center punch. Free upon request.

Acme Industrial Co., 200 N. Laflin, Chicago 7, Illinois.

Use postpaid card. Circle No. 19

FIBRE TOTE BOXES REDUCE PARTS HANDLING PROBLEMS

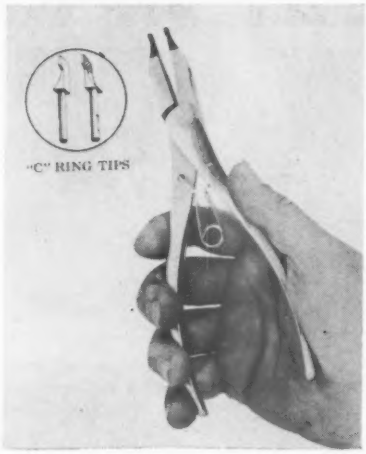
Vulcanized fibre tote boxes are designed to handle parts between machining operations.

Kennett tote boxes solve the problems of parts identification, wasted space, delay and worker fatigue. As an aid to production control, tare weights are stenciled to the sides of the boxes, which range in size from 0.625 to 2.3 cu. ft. Handles at each end of the boxes make lifting safe and easy. Corners and edges are metal reinforced for strength and long life. Boxes are designed for multiple stacking.

National Vulcanized Fibre Co., 1059 Beech St., Wilmington 99, Del.

Use postpaid card. Circle No. 20

SERRATED TIPS AVAILABLE FOR SNAP RING TOOLS



Serrated tips to handle C or holeless snap rings have been added to a line of replaceable tipped snap ring tools. The tips have the same advantage as the regular straight or angled tips for use with holed snap rings. When worn out, they can be discarded and new tips inserted in the basic tool.

Milbar Corp., 1900 Euclid Ave., Cleveland 15, Ohio.

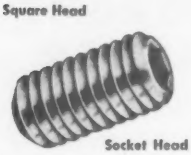
Use postpaid card. Circle No. 21

design, purchasing, production men . . .

here's why you're right with MOORE SET SCREWS

Headless Slotted

Square Head


Socket Head

Design — there's a Moore Set Screw exactly right to meet your specs. On new developments or on hard-to-solve problems we have experienced men to supply the answers.

Purchasing — you can depend on us, without question, to meet your schedules. Your reputation is backed up by our reputation of 80 years of dependable service.

Production — our inspection guarantees conformity and uniformity. Your assembly lines run smoothly and quality control is simplified.

Moore Set Screws simplify design, purchasing, production. Send for detailed price catalog.

MOORE SET SCREWS

George W. Moore, Inc.
since 1880
91 Beaver St., Waltham 54, Mass.

Use postpaid card. Circle No. 248

New **Flip-Loc Fastener**

WORLD'S FASTEST LINE CLAMP

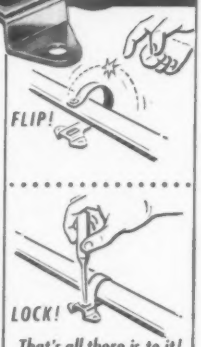
Cuts Costs TO 80%

- Distortion-free
- Self-aligning
- High strength
- Self-contained

SAVES YOU TIME AND MONEY IN THESE WAYS:

1. Cuts installation time
2. Cuts maintenance and inspection time
3. Cuts costly clamp replacement
4. Offers extra strength for heavier loads

The FLIP-LOC is a brand new TA exclusive. It is a completely self-contained fastener. You can open and close it quickly with just one hand. Integrated hinge makes the clamp stress-free, trouble-free, and simple to use. Made of 321 stainless steel, the Flip-Loc is available in your choice of insulator cushion liners: Neoprene rubber (general purpose), AW (aromatic fuel and weather resistant), and corrugated stainless (extreme high temperature). The Flip-Loc is available in sizes from ¼ to 6" in diameter.



That's all there is to it!

Write for free literature which describes the new TA Flip-Loc in detail.

TA Mfg. Corp.
4607 Alger Street • Los Angeles 39, Calif.
(or call CH 5-3748)
TWX 9863 Glendale, Calif. • WUX CAT Los Angeles, Calif.

Write for free Engineering Design Manual, Bulletin 210G (94 pages) shows hundreds of standard clamps for almost any harnessing application.

Use postpaid card. Circle No. 249

PORTABLE HEATER PREPARES WIRE FOR HEADING

A 5 kva resistance heating unit used to warm wire stock prior to fastener heading completes a range of Reslec heaters from 5 to 1800 kva. It can handle .050" to .213" wire.

The portable unit stands 14" high with only one connection required. It can also be used in wire drawing mills where annealing and processing can be done at fast rates while wire is in motion, in silver soldering operations and in the stretch forming of titanium.

The Herscott Corp., 1435 Preston St., Rockford, Illinois.

Use postpaid card. Circle No. 22

PORTABLE, 205 AMP. WELDER HEAVY DUTY APPLICATIONS

The Portarc 205 portable, heavy duty welder is designed for applications that require manual welding. The 70 lb., 205 amp. unit has a full 60% duty cycle, plus an 80 open circuit voltage for six heat taps.

The welder has a thermal overload protector, aluminum cabinet and multiple-impregnated transformer for protection against high humidity.

The Emerson Electric Mfg. Co., 8100 Florissant Ave., St. Louis 36, Mo.

Use postpaid card. Circle No. 23

ELECTRICAL · AIRCRAFT · ELECTRONIC · AUTOMOTIVE
COMMUNICATIONS · ANY INTRICATE WORK

Here are real timesaving tools for electrical and electronic assembly and maintenance, or any other limited space work.

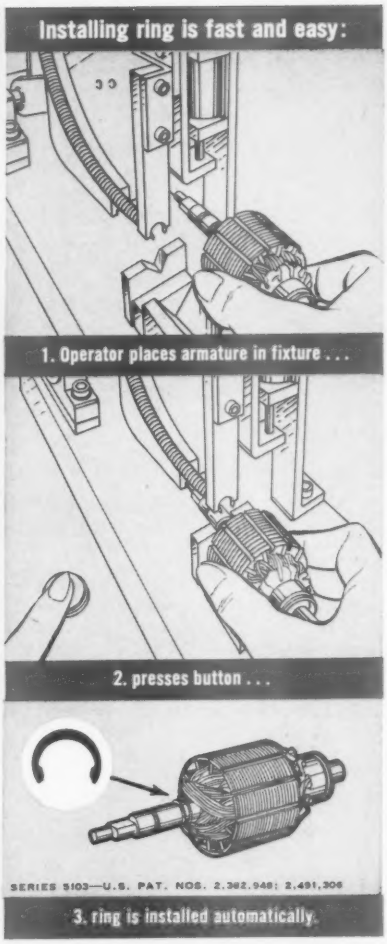
Thin driver blade tip is the same width as the shank diameter, to follow screw below surface or work among intricate assemblies. Blades are made from extra-tough alloy steel for long life. Tips are precision-machined to seat properly in screw slots to prevent slippage and damage.

Crimped shanks anchor firmly to prevent turning in handles. Two blade widths — 1/8 in. and 3/16 in. Blade lengths of from 2 in. to 10 in. Available individually or in sets of five.

Insulated handles are shockproof and practically unbreakable. "Octo-Grip" handle shape prevents tool from rolling and provides for a powerful turning grip without hurting the hand.

Put new speed in those limited space jobs with these new SNAP-ON thin-blade screwdrivers. They'll pay for themselves in short order. Write us or call your nearest SNAP-ON branch.

FOR ALL INDUSTRY
SNAP-ON TOOLS
8033-B 28th AVENUE • KENOSHA, WISCONSIN
Use postpaid card. Circle No. 250


Installing ring is fast and easy:
1. Operator places armature in fixture . . .
2. presses button . . .
SERIES 5103—U.S. PAT. NOS. 2,382,948; 2,491,306
3. ring is installed automatically.

Mechanized Truarc ring installation speeds assembly

eliminates costly shimming and gauging operations

Fast, semi-automatic assembly and the elimination of costly production operations are among the benefits Leece-Neville Co., Cleveland, Ohio, derives from the use of Truarc retaining rings in the manufacture of its fractional horsepower automotive motors.

Radially-assembled Truarc Series 5103 Crescent® rings—supplied pre-stacked—are used to position and lock the armature in the motor housing. Using the special Truarc pneumatic applicator-dispenser illustrated above, the operator merely inserts the rotor and presses a release button. The ring is installed automatically in a pre-cut groove on the rotor shaft!

The precision manufactured Truarc rings, seated in accurately located grooves, reduce accumulated tolerances from a possible maximum of .184" to .025". Costly, time-consuming shimming operations previously necessary to take up end play are eliminated, together with as many as four gauging operations required to select and place the shims.

The Leece-Neville story is just one example of the way Truarc retaining rings are stepping up production on today's fast-moving assembly lines. These versatile fastening devices simplify design, speed assembly and eliminate rejects. In replacing conventional fasteners, they often improve product performance and reliability. All of these advantages are in addition to substantial cost savings!

Truarc retaining rings come in 50 functionally different types . . . up to 97 different sizes within a type . . . 6 metal specifications and 13 finishes. Special Truarc hand, magazine and automatic applicators and grooving tools make production-line application easy on virtually every type of product. Make sure you have on file the new 16-page Truarc assembly-tool catalog No. AT 10-58. Write for your copy today. And remember Waldes Truarc engineers are always ready to assist you with your special production problems. Write: Waldes Kohinoor, Inc., 47-16 Austel Place, Long Island City 1, New York. 9.13

WALDES
TRUARC®
RETAINING RINGS
Waldes Kohinoor, Inc., Long Island City 1, N. Y.

TRUARC RETAINING RINGS . . . THE ENGINEERED FASTENING METHOD FOR REDUCING MATERIAL, MACHINING AND ASSEMBLY COSTS

©1959 WALDES KOHINOOR, INC.

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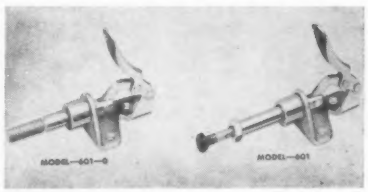
WHAT'S NEW IN FASTENING AND JOINING

For further information on any of the fasteners or methods listed here, use the hand postpaid card opposite page 74.



(See 27)

HAMMER-DRIVEN BLIND RIVET ASSORTMENT KIT

Approximately 1000 fasteners which can be applied with only a hammer are offered in a Drive Rivet Kit. The assortment includes a variety of rivet grip lengths.

These rivets are placed in a drilled hole and struck with a hammer from the head side of the job; no need to back up sheets or reach the other side of the work. Sheets are pulled tightly together by the expanding action of the rivet. The kit includes 3/16" & 1/4" diameter full brazier head aluminum drive rivets. Complete installation instructions are given.

Southco Div., South Chester Co., Lester, Pennsylvania.

Use postpaid card. Circle No. 25

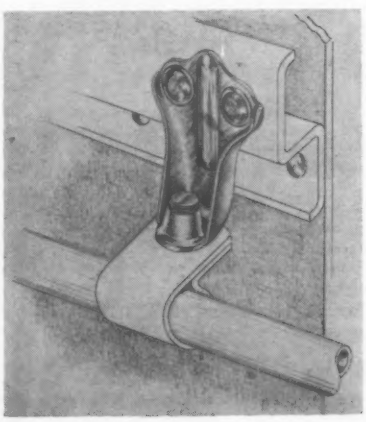
(See 25)

LINE CLAMP CUSHIONING MATERIAL IS LONG LASTING

A new cushioning material is being used on line clamps for the aircraft industry. Comparable in cost to standard AF-specification materials, the AW (aromatic fuel and weather resistant) insulation is longer lasting and safer. A free sample test kit of both materials is offered.

TA Mfg. Corp., 4607 Alger St., Los Angeles 39, Calif.

Use postpaid card. Circle No. 26



(See 28)

PLUNGER-TYPE TOGGLE CLAMPS LIGHT ASSEMBLY

Two plunger-type toggle clamps that lock in either an extended or retracted position have been added to the standard line of De-Sta-Co Clamps. Designed principally for general-purpose use in light assembly work, the clamps have a rated holding pressure of 95 lbs.

Model 601 has a tapped hole in the plunger to take a rubber-tipped adjustment spindle and lock nut for extending or shortening its reach. The 601-0 has a ¼-20 thread on the plunger end to allow easy positioning of various holding devices. Center distances of base mounting holes are ⅝-inch to fit standard aircraft peg-board assembly plates. The height from the base to the centerline of the plunger is ½-inch. Plunger travel on a complete stroke is ⅝-inch.

Detroit Stamping Co., 350 Midland Ave., Detroit 3, Mich.

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LOCKING-BRACKET NUT FOR ATTACHING WIRE BUNDLES

A one piece, self-locking right angle bracket nut has been developed for use in attaching wire bundles and plumbing lines to missile and airframe structure.

Made of cadmium-plated carbon steel, heat treated, for performance at temperatures up to 550° F., the LHA71 exceeds performance requirements of MIL-N-25027(ASG). Mounting holes .130" diameter permit the use of ⅛" aluminum alloy rivets to develop full bracket strength. It is presently designed in the 10-32 thread size in three bracket lengths of .450", .650" and .850" to provide variations in clamp location.

Elastic Stop Nut Corp. of America, 2330 Vauxhall Rd., Union, N.J.

Use postpaid card. Circle No. 28

BLIND SNAP-IN RETAINED NUTS IN STANDARD SIZES

Blind snap-in retained nuts are now stocked in standard sizes for screws from No. 6 to ¼".

Plasti-grommets are fabricated from moisture-conditioned nylon. They eliminate cross-threading, provide insulation at the fastening point, accommodate mis-alignment and can be used as spacers. They are mounted from the front for ease of assembly.

Fastex, 195 Algonquin Rd., Des-Plaines, Illinois.

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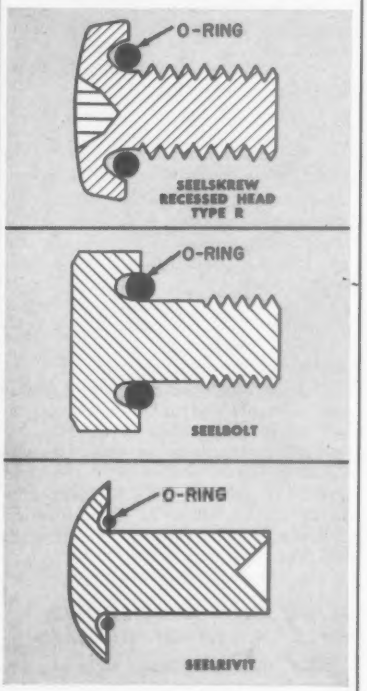
SELF-CURING ZINC COATING IS CORROSION RESISTANT

A self-curing zinc coating, Zinkote, 100% inorganic, gives bare steel complete protection from water, severe weathering, salt spray and abrasion. Applied in a single coat only a few mils thick, it cures itself to metallic hardness and adheres permanently.

SEELSKREWS®
SEELBOLTS®
SEELRIVITS®
High Pressure Self-Sealing
FASTENERS



- Removable and static self-sealing screws, bolts and rivets.
- These industrial fasteners meet all applicable military specifications.

SEND FOR CATALOG 359A-3
describing items above, also seals for switches, shafts, circuit breakers, indicator lights and other electronic components.

A. P. M. Corporation
252 Hawthorne Ave., Yonkers, N.Y.
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HIGH PRESSURE STATIC AND MOVABLE SEALS
HEXSEALS® • SEELSKREWS® • SEELBOLTS® • SEELRIVITS®

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Zinkote is unaffected by solvents and is not flammable, volatile or toxic. It may be used on steel structures or members of any size, before or after erection, and is applied with regular painting equipment.

Amercoat Corporation, 4809 Firestone Blvd., South Gate, California.

Use postpaid card. Circle No. 30

STOCK SPRING, FUSE CLIPS; LOCK WASHER TERMINALS

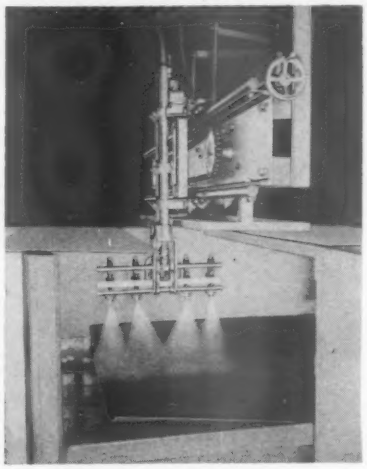
A wide variety of spring and fuse clips and lock washer terminals are now available from stock. The new additions round out a line ranging from lugs, clips, terminals, metal stampings, wire forms to other types of electrical parts.

The new lock washer terminals are manufactured with No. 4, No. 6, and No. 8 holes from .018" brass or phosphor bronze, hot tinned. Sample kits.

Zierick Mfg. Corp., 110 Beechwood Ave., New Rochelle, N.Y.

Use postpaid card. Circle No. 31

ELASTOMERIC BASE ADHESIVE FOR AUTOMATIC SPRAYING



A high-strength-oil-resistant elastomeric base adhesive developed for automatic spray application produces bonds with high softening points and excellent resistance to plastic flow. These properties, combined with EC-1390's, rapid rate of strength buildup and sprayability, makes it well suited for volume production applications. This adhesive may also be hand sprayed or brushed.

Wood-to-steel bonds have shear strengths in the range of 400 psi. Aluminum-to-plywood bonds have ten-

Close Tolerance Bolts
Nuts • Screws
Washers • Pins
Studs • Grommets
Clamps • Rivets
Electronic Parts
Aviation Lamps
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All sizes & types

All metals
Stainless & Nylon
Our specialty

immediate service

AN • MS • NAS
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Emergency and short runs a specialty

No quantity too small
One or 1 million

No tolerance too close to handle

No waiting 6 to 8 weeks, we do it in less than 1 week . . . because our stocks, our equipment and our staff are specialized. We make the purchasing agent's and the engineering department's job easier. Your assurance: quality, dependability and service!

Send for our catalog RIGHT NOW or let us quote on your requirements.

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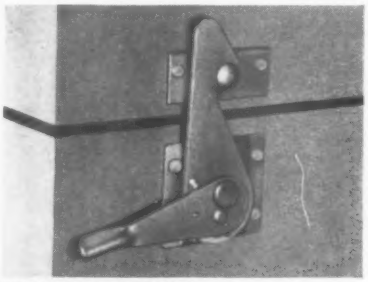
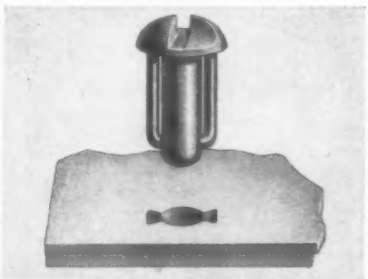
ANSWERS to specific fastening problems ...by SIMMONS

Economy, design flexibility, quick and easy installation, strength, and smooth, dependable action are advantages of these Simmons Fasteners, made for a variety of special applications. Whatever your fastening problem, engineering aid is available from Simmons.

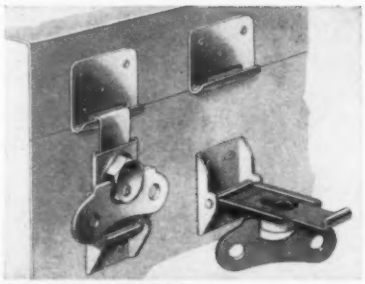


HOOK-LOCK–Springless, positive-locking latch which lies flat against mounting surface, open or closed. Provides high closing pressure and load-carrying capacity. For military as well as commercial container applications.

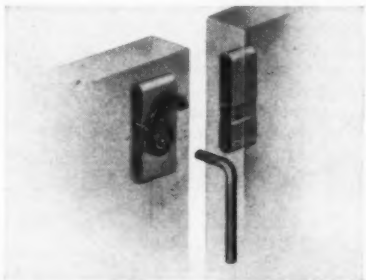


SPRING-LOCK–Perfect, proved blind rivet for removable covers and panels on electric and electronic equipment, sheet-metal automobile parts, appliances.

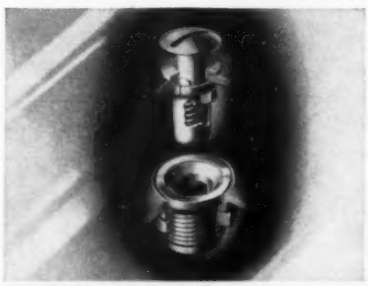
Plastic Spring-Lock Shelf Supports with "heart of steel" help refrigerator makers cut costs, speed production, simplify servicing.



LINK-LOCK–Ideal latching device where heavy locking pressure is necessary. Available in heavy, medium, light duty, for use in military and commercial containers and demountable construction.



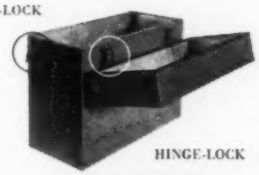
DUAL-LOCK–Impact and vibration-proof high-load butt-joint fastener that will not accidentally unlock or loosen. Recess in panels or surface mount. Withstands 7000-lb. tension.



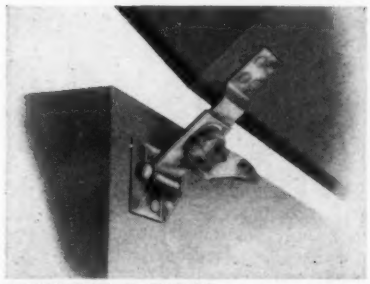
QUICK-LOCK–For assembling removable panels and access doors. Locked by a 90° turn. Various sizes and types, for weather-tight electrical units, cowlings, access panels.

SEND TODAY for your copy of the Simmons catalog, with specifications, applications, installation instructions for all Simmons Fasteners. Samples are available. For special assistance, describe your requirements.

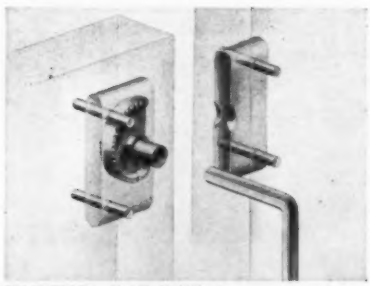
LINK-LOCK



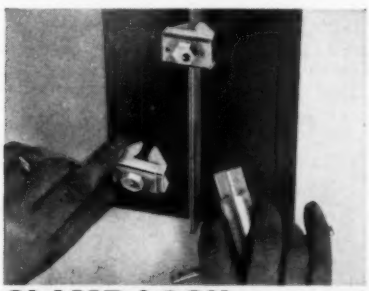
HINGE-LOCK



HINGE-LOCK–A rugged pressure hinge which provides a strong seal along the hinge line of gasketed equipment containers and transit cases. Matched hardware with LINK-LOCK.



ROTO-LOCK–Versatile fastener for butt or right-angle joints in portable shelters, partitions, knock-down shipping boxes, etc. Solidly built, springless.



CLAMP-LOCK–A simple and strong, positive-locking clamp for fast assembly (and disassembly) of permanent or temporary rooms and buildings of flanged-panel construction.

SIMMONS FASTENER CORPORATION

1796 North Broadway, Albany 1, New York

See our condensed catalog in Sweet's Product Design File

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sile shear strengths of 400 psi immediately after cooling from the cure temperature and peel strengths of 30 to 40 pounds per inch width after aging four days at room temperature. High pressure plastic laminate-to-steel bonds have tensile-shear strengths of 400 psi and peel strengths averaging 50 pounds per inch width.

AC & S Div., Minnesota Mining & Mfg. Co., 900 Bush St., St. Paul 6, Minneapolis.

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ONE-PIECE EXPANSION BOLT ELIMINATES MARKING

A one-piece, single integral expansion bolt is designed to simplify the fastening or anchoring of electrical equipment, structural members, machinery, etc., in concrete, masonry, plastic, stone, steel and other nonfrangible materials. The Wej-It eliminates the need for marking operations, requires only one-size hole and expands as it is wrench-tightened to provide a perfect, lasting anchor. It is available in sizes ranging from ¼" O.D. x 1⅜" long to ¾" O.D. x 12".

Kivel Inc., Kingston, N.Y.

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DRY PHENOLIC RESIN SUPPORTED BY PAPER FILM

A new type of industrial adhesive—a dry phenolic resin supported by a paper film—eliminates the need for glue spreading equipment.

Immediate applications are in the manufacture of exterior and marine grade plywood; in bonding veneers, plastic overlays, thin metal sheets and other surfacing materials to plywood, chipboard, hardboard and metal or paper honeycombs.

In practice, a sheet of the adhesive is placed between the two surfaces to be joined and the bond is cured either in a hot press or by means of high frequency field heating. Layups may be stored for considerable periods at normal temperature and humidity before pressing.

Standard widths are 38, 50 and 62 inches, allowing a two-inch trim for 3, 4, and 5-foot-wide product manufacture. Plyophen 2000-PGL introduces practically no moisture into the joint, completely eliminates bleed-through in most cases and provides complete control of adhesive flow.

Reichhold Chemicals, Inc., 532 N. Broadway, White Plains, New York.

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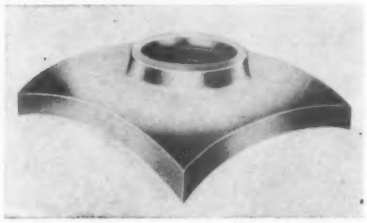
ONE-PIECE, SELF-LOCKING NUTS ELIMINATE WRENCHING



A line of spring-nuts are self-locking, one-piece units which do not require lock washers and wrenches. They are available in steel, aluminum, silicon bronze, stainless steel—plated to specifications, in sizes No. 4 through ⅜". Tapped class—2B. Samples.

Jacobson Nut Mfg. Corp., Box 177, Kenilworth, N.J.

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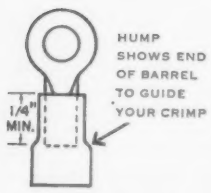
SPECIAL PLASTIC INSULATING SLEEVE now available on most ETC solderless terminals and connectors



INSULKRIMP*

The permanently attached sleeve is tough and rigid—can't slip off, break or unravel. INSULKRIMP* terminals are applied with one quick crimp—no more time lost insulating with tubing or tape. Plastic sleeve also supports the wire insulation, giving increased resistance to vibration. Sleeves are color-coded for wire range. Write for samples, prices.

*Trade Mark

ETC INCORPORATED
990 East 67th Street, Cleveland 3, Ohio

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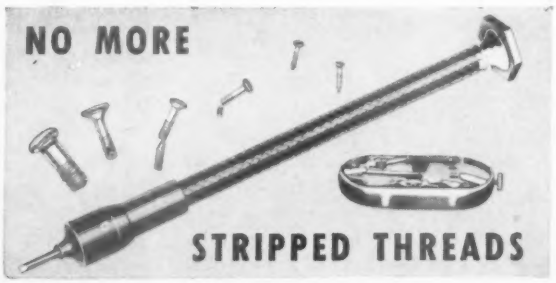

...OR BUCKLED AND BROKEN MOVEMENT PLATES
...RUINED PRECISION ASSEMBLIES AND FINDINGS

Apco Mossberg's New Tiny Torque Screwdriver lets you control those delicate tiny torques from 0 to 3 tenths of an inch-ounce, or from 0 to 6, 8, or 10 tenths of an inch-ounce!

A Precision Jeweler's-Type Screwdriver, Tiny Torque "fits the hand," enables even the inexperienced to tighten tiny screws without shearing threads, cramping gears, fragile parts.

Designed for #0 to #2-56 screws, and for #0 to #4 screws using interchangeable hardened screwdriver blades. Only 4¾" long. Easy-to-read white, etched graduations on barrel. Write for Details!

APCO MOSSBERG COMPANY
215 Lamb Street, Attleboro, Mass.

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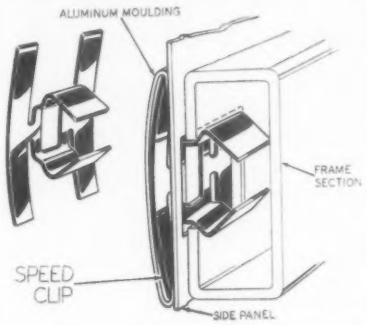
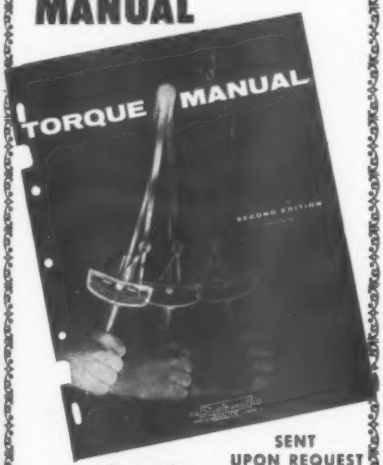
SPRING CLIP FOR SECURING MOULDING



A Speed Clip developed to secure aluminum moulding to truck and coach bodies is designed to accommodate moulding approximately 3" wide and runs the entire length of the truck body. The spring steel fasteners are spaced about a foot apart and hold the moulding snugly against the side panels.

Assembly of the moulding requires no special tools or skills. The clips are merely inserted at either end and moved along the inside of the moulding to the desired positions. The arch in the back of the spring steel clip holds it in place. The moulding is then snapped on the side panel. As the dart-shaped legs of the clip pass through

"TORQUE WRENCH" MANUAL



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Formulas
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Screw Torque Data
Adapter Problems
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P.A. STURTEVANT CO.
ADDISON QUALITY ILLINOIS

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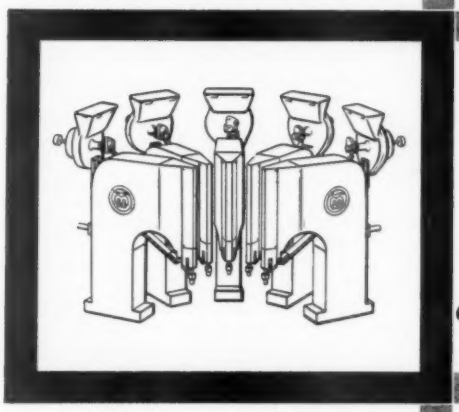
NEW "BUILDING BLOCKS" ... for automatic riveting

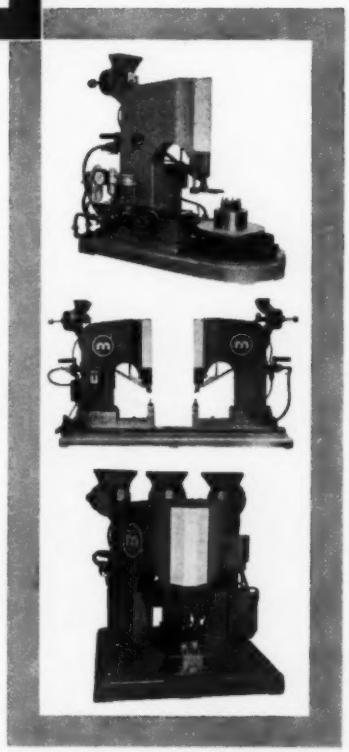


Milford's Models 56 and 57 offer unlimited flexibility in automatic assembly

The narrow wedge shape of Milford's new air-actuated riveters permits unusually close riveting. Both models can be combined with sliding-fixtures, indexing tables or similar attachments to give greatest flexibility of assembly. Air-operated toggle action assures fast and safe action. Model 56 handles tubular rivets from 1/8" diameter x 5/8" length; Model 57 from 3/16" diameter x 3/4" length.

Group these new "Building Blocks" to suit your own production needs. Use them singly, in pairs, in threes, fours or even fives. Multiple riveting is the newest answer to reducing production costs.

For more new ideas, tips and technical data on tubular rivets and rivet-setting machines, ask your Milford Representative for a look at Milford's new MANUAL OF MODERN RIVETING PRACTICE.



THE MILFORD RIVET

MILFORD RIVET & MACHINE CO.
MILFORD, CONNECTICUT • HATBORO, PENNSYLVANIA
ELYRIA, OHIO • AURORA, ILLINOIS • NORWALK, CALIF.

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the panel hole they compress, then expand on the underside to grip the panel and hold the moulding under constant live spring tension without vibration loosening. Removal is easily accomplished by inserting a simple tool under the moulding edge and prying upward.

This clip can also be considered as a retainer for inspection plates, decorative automobile dashboard cut-out covers, extruded aluminum mullion covers, trim on metal furniture and in many other similar applications.

Tinnerman Products, Inc., Box 6688, Cleveland, Ohio.

Use postpaid card. Circle No. 37

MINIATURE, SELF-LOCKING, 160,000 PSI HEX NUT

A self-locking 160,000 psi hex nut is so small the head of a safety match can hide it. Kaylock H14-02 weighs .02 lbs. per hundred and its strength and smaller envelope make it useful for electronic systems of aircraft.

Kaynar Mfg. Co., Box 2001, Terminal Annex, Los Angeles 54, Calif.

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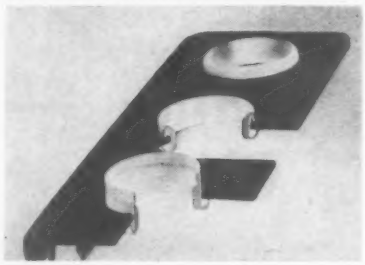
NYLON GROMMET FITS SNUGLY, INSTALLS EASILY



A one-piece, solid grommet of Zytel 103 nylon, having unusual safety and installation features, fits snugly and cannot shake loose nor pop out.

Flip Grommet's nylon wears extremely well and does not chafe material, such as electrical wire, which may pass through the grommet. The grommet is used in the temperature range of -65° to 300°F.

Installation is simple. No heat is needed; the grommet is merely inserted through the aperture and flanged over by a simple tool. The tool may be used in a common drill or arbor press or, if necessary, in a hand pressure mechanism. Hoop stresses induced in the flange hold the grommet in place permanently.

Each size, from 3/16" to 2-1/2" in diameter, fits sheet gauges ranging from .025" to .250" in four basic lengths. Free sample card.

Western Sky Industries, 21301 Cloud Way, Hayward, California.

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PLASTIC ADHESIVE HAS NON-METALLIC BASE

A plastic adhesive which adheres to most metals but has a nonmetallic base, is non-conductive and not affected by corrosive chemicals.

Bond-Seal is intended for watertight and oil tight repairs on metals and other materials when non-conductivity and resistance to acids and alkalies is needed.

Specifically developed for use in electronic applications where adhesives containing metallic fillers are not acceptable, the product has tested up to 3000 pounds in tensile shear. Bond-Seal will not adhere to plastics like vinyl, polyethylene or polystyrene.

Beetle Plastics of Crompton & Knowles, Fall River, Mass.

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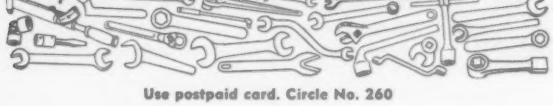
Fine tools that encourage Good Work

ARMSTRONG WRENCHES

If you don't know your local ARMSTRONG Distributor, we will send you the names of those in your area.

An ARMSTRONG Wrench feels right—is balanced. It goes over nuts or screw heads easily, grips firmly without sloppiness, won't round corners—because openings are carefully machined to correct sizes. It's safe, strong beyond need without clumsy bulk—because of superior design and selected steels, heat treated to proper degree of hardness and tensile strength. It's quality finished, ARMALOY (alloy steel) Wrenches in chrome plate with heads buffed; HI-TEN (carbon steel) Wrenches in baked-on gray enamel with heads ground bright . . . all plainly marked for size. All are uniformly excellent tools manufactured under strict quality control, by modern methods, with modern equipment in a modern tool plant . . . 1537 different industrial sizes and types —single wrenches, or sets in metal cases, boxes or rolls . . . each a quality tool. Armstrong Wrenches are "Fine tools that encourage good work."

ARMSTRONG BROS. TOOL CO. 5203 W. ARMSTRONG AVE. • CHICAGO 46, U.S.A.



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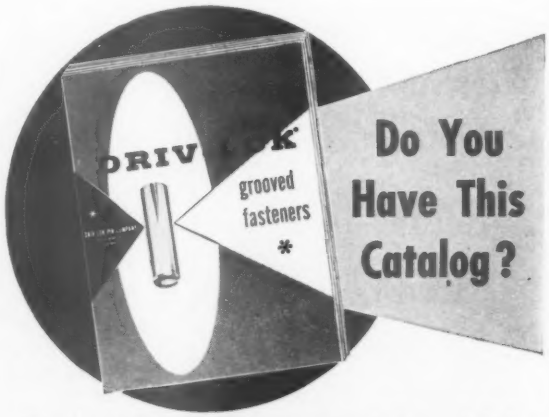
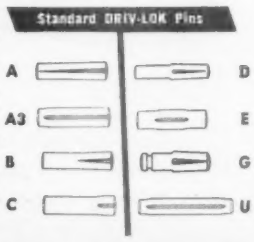


Contains Complete details on grooved pins and studs YOURS FOR THE ASKING!

Write for your copy of the DRIV-LOK catalog today. Contains factual data in concise, easy to use form. Illustrated with typical applications that may help solve a fastening problem for you. Sent without obligation, of course.



DRIV-LOK SALES CORPORATION

731 Park Avenue • Sycamore, Illinois

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MOLDED BLACK NYLON SCREWS IN NEW SIZES

A line of molded black nylon screws has been expanded to meet increased demands for shorter lengths to fit into sub-miniature assemblies and components. Added to the round head line are ¼" and ⅛" lengths with 2-56 thread sizes. The company's fillister head styles now include these new sizes: 4-40x½; 6-32x¼, ⅜ and ½; 8-32x ⅜, ½ and 1½; 10-32⅜, ½, ⅝, 1½.

All stock lengths of the screws have a chamfer and molded lead thread to facilitate starting. Nylon screws eliminate the need for special insulating washers or bushings. They are lightweight, non-conducting, non-magnetic, resistant to corrosion and fungus and retain exceptional toughness over a wide temperature range.

Weckesser Co., Dept. AE-3, 5701 Northwest Hwy., Chicago 46, Ill.

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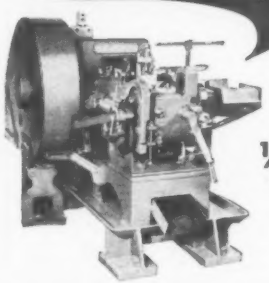
BEHR SINGLE and DOUBLE STROKE

COLD HEADERS

FOR UPSETTING AND FORGING BOLTS, SCREWS, RIVET HEADS AND OTHER SIMILAR SHAPES!



¼"x2" CAPACITY

Capacity of wire, 1/4"; Stroke, 3"; Maximum length of cut-off, 2-7/8"; Maximum length of blank under head, 2"; Diameter and length of heading die, 1-3/4" x 2-1/2"; Diameter of finished punch, 1-1/4" x 2-1/4" long; Speed — Number of pieces per minute, 175; Number of strokes per minute, 350; Lubrication, Force Feed; Weight, 6000 lbs.; Overall dimensions, 81" x 46" x 51"; Motor, 5 HP, 3 phase, 60 cycle, 220/440 volts. Each header complete with motor, push button station, and foot brake.

MANVILLE 250C HEADER PARTS AVAILABLE FROM STOCK

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BEHR MACHINERY & EQUIPMENT CORP.
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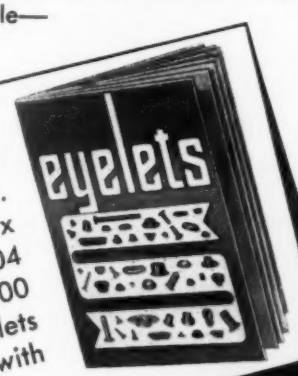
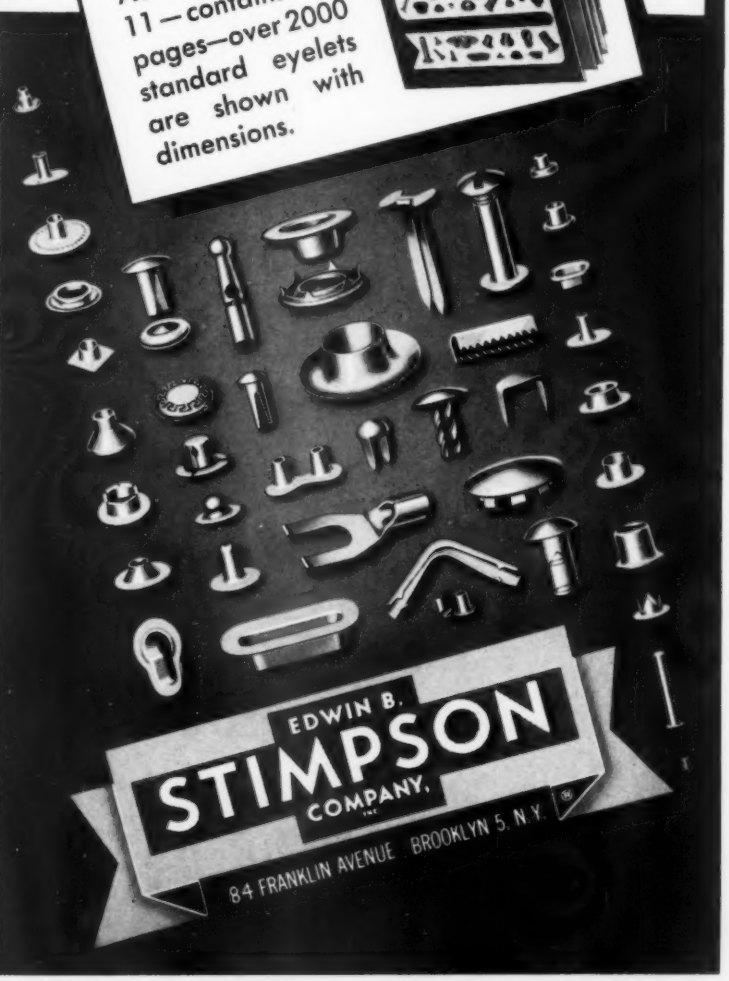
Are You Familiar With The Different Articles We Make?

You will find us prepared to supply a type of fastener that is exactly suited to your specific requirements. If you use split rivets, tubular rivets, side-prong rivets, eyelets, washers, grommets, snap fasteners, or any other similar metal article— write for samples and prices—today.

Send for your copy of this valuable free book. Actual size 8½ x 11—contains 104 pages—over 2000 standard eyelets are shown with dimensions.





EDWIN B. STIMPSON COMPANY, INC.
84 FRANKLIN AVENUE BROOKLYN 5, N.Y.

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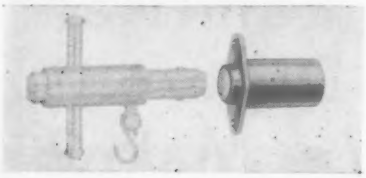
FLUSH MOUNTED RECEPTACLE FOR QUICK RELEASE PINS



A new receptacle for quick-release pins is designed for flush skin mounting. The permanent receptacle can also be used as an attaching point for hold-down straps, test equipment or to serve as winching points, in aircraft applications.

The pin and receptacle combination eliminate the possibility of accidental release. The pin release button must be pushed and pin pulled in one motion to release.

They are available in four diameters from 3/16" through ⅜".

D. W. Price Corp., 11161 W. Pico Blvd., Los Angeles 64, Calif.

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COPPER-PHOSPHOROUS ALLOY NEEDS NO FLUX

A copper-phosphorous alloy does not require flux on copper to copper joints. It starts to melt at 1300°F and is adaptable for electrical, construction, air conditioning, heating and plumbing industries.

Brazing range for Phos-Sil O is from 1350°F to 1500°F. Original tensile strength is 90,00 psi. It conforms to all AWS, ASTM and Federal specs.

American Brazing Alloys Co., Box 11, Pelham, New York.

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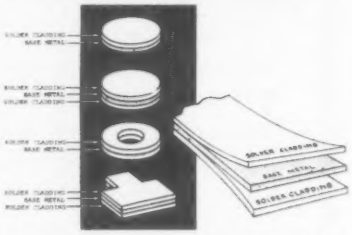
SOLDER CLAD STAMPINGS JOIN DISSIMILIAR METALS



Strips of base metals such as nickel, kovar, molybdenum steel and others are now being clad on one or both sides with tin-lead solders, silver, gold and related alloys through a new bonding process.

The clad strip is stamped into discs, washers and special shapes for use in automatic joining operations. Such stampings are also used as heat sinks, base rings or tabs, diaphragms, and contacts for special electronic applications.

Alloys Unlimited, Inc., 21-01 43rd Ave., Long Island City, N.Y.

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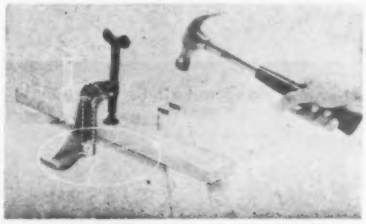
WORK CLAMP NOT LIMITED TO EDGE-OF-BENCH POSITION



A clamp that holds work firmly on any surface, without being limited to positions near the edge, has been added to the Jorgensen line of clamping devices.

The clamp attaches to any wood or metal work surface by means of a bolt spotted in the middle or along the edge of the work area. A slot in the base of the clamp engages protruding head of holding-bolt so that clamp slides into work position instantly. When not in use, clamp may be removed, leaving work area unobstructed.

For either production set-ups or quick-change operations on a drill press or machine table, the holding-bolt fits into T-slots or existing holes to hold work solidly.

Adjustable Clamp Company, Dept. HC-30, 417 N. Ashland Ave., Chicago 22, Illinois.

Use postpaid card. Circle No. 45

Weckesser Plastic Products

WRITE FOR FURTHER DETAILS, SPECIFICATIONS AND PRICES

Weckesser COMPANY

5701-A Northwest Highway • Chicago 46, Ill.

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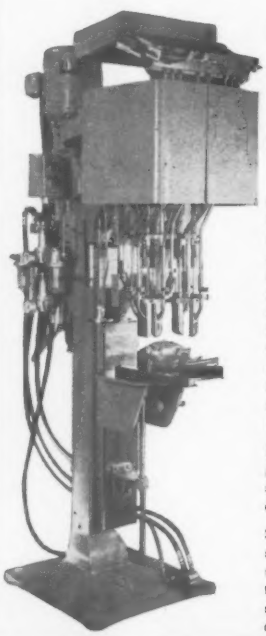
this machine will drive up to 10 screws at one time . . .



. . . reducing assembly costs and improving quality. Built for high production jobs where a fixed set up is practical, this multiple spindle screw driving machine automatically feeds screws from a hopper and drives them to a predetermined torque. Evenly distributed pressure eliminates stresses caused by driving home one screw at a time. A simple sliding fixture positions work pieces accurately.

Machine illustrated shows application of multiple spindle screwdriving to assembly of electric power drills.

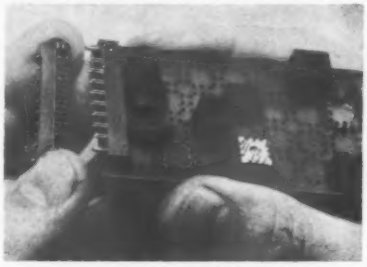
Send a sample of your assembly and a list of your requirements. We will be happy to show you how multiple spindle screw driving can be applied to your job.

COOK & CHICK COMPANY

2415 West 24th Street Chicago 8, Illinois

Use postpaid card. Circle No. 265

GOLD PLATED CONNECTORS FOR MINIATURE CIRCUITS



A line of connecting devices for micro-modules and other miniaturized circuitry provides protection against corrosion with gold-plated contacts. Because of this feature, connectors increase their reliability in "dry circuitry," and, in addition, allow for easier soldering.

Equally important in these small connectors, is the extremely low insertion and withdrawal forces; less than 0.5 pound insertion force, and less than 0.25 pound per contact for withdrawal. Connecting devices in the line include module header, module receptacle, straight-thru connector and right angle connector. Designed for the 0.050 printed circuit grid, these connectors afford high contact density. The entire line conforms to Signal Corps Specifications SCL-6250.

Molded Insulation Co., 335 Price St., Philadelphia 44, Pennsylvania.

Use postpaid card. Circle No. 46

TORQUE BOOKLET

This 24-page booklet contains reprints of five authoritative articles on the subjects of "torque, tension and tightening." These articles were originally published in "Assembly & Fastener Engineering."

- WHAT IS PROPER TORQUE?
- HOW TIGHT IS TIGHT?
- HOW TO DETERMINE TORQUE TENSION RELATIONSHIPS
- TIGHTENING THREADED FASTENERS
- POWER TOOLS FOR TIGHTENING THREADED FASTENERS

The booklet is available for $1.00 per copy upon letterhead request to:

Reader Service Department
ASSEMBLY & FASTENER ENGINEERING
WHEATON, ILLINOIS

Are you designing to series 60 standards? If so, specify Bristol.

This DOUBLE-DIAMOND knurl marks the BRISTOL "Series '60"

. . . the cap screw that holds more . . . indents less . . . wrenches tighter than ever before . . . meets or exceeds all new "Series 1960" standards of Socket Screw Manufacturers' Committee. Of course, regular Bristol "Series 1936" standard screws are still available in hex or Bristol Multiple Spline.

Precision socket screw manufacturers since 1913

*Made in sizes as small as No. 0 in Alloy Steel and Stainless Steel. Cap screws up to 1½" diameter.

THE BRISTOL COMPANY Socket Screw Division Waterbury 20, Conn.

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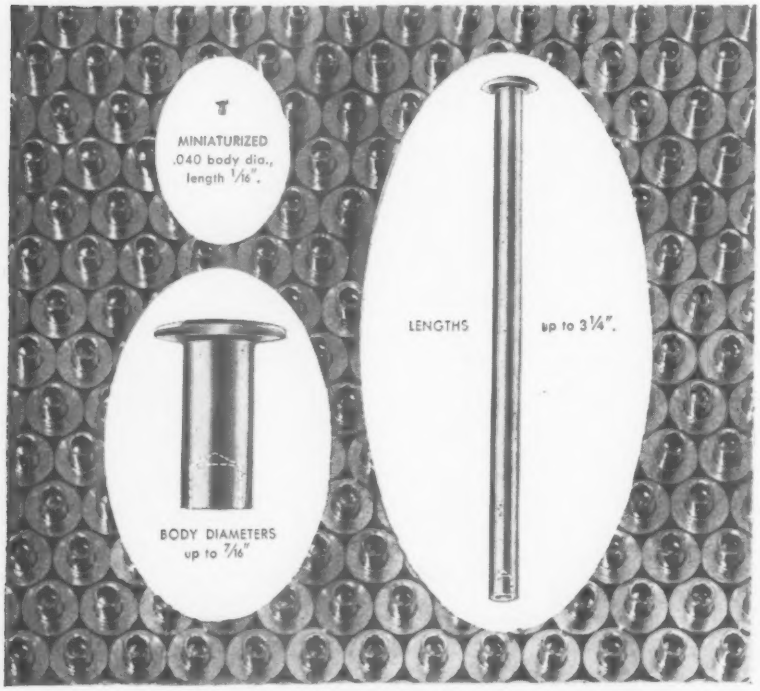
Look at this Size Range of Semi-Tubular Rivets... it's the way to lower cost



Miniaturized components and also large complete assemblies can now have all the money-saving advantages of using single and multiple automatic riveting. This is due to the wider size range of semi-tubular rivets now available and which can be used in conjunction with motor and pneumatic driven automatic riveting machines.

Today, there is hardly a fastening problem, involving even fragile materials, that does not warrant consideration of low-cost semi-tubular rivet setting.

Our Factory Riveting Specialists are ready to help you obtain the REAL COST FACTS on your own specific fastening problem. There is no obligation.

FOR YOUR FILES

Chicago Rivet Catalog describes 1388 standard tubular and split rivets and 25 single and multiple automatic rivet setters.

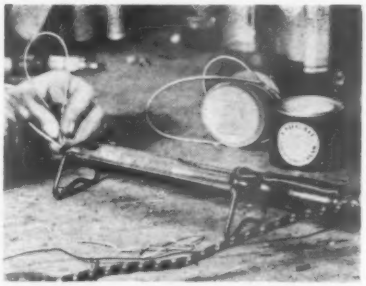
AIR-POWERED RIVETING

contains description and specifications of 8 single, multiple riveters— also rivet setters designed for automated operation.

Chicago Rivet & MACHINE CO.

946 So. 25th Ave., Bellwood, Ill. (Chicago Suburb)
Branch Factory: Tyrone, Pa.
Use postpaid card. Circle No. 267

FLUX PROTECTS SOLDERED METAL FROM CORROSION



A soldering cream increases the activity of a flux without the use of mineral acids, while protecting the metal soldered from corrosive attack of the active ingredients.

Fairgail solders metals such as phosphor bronze, as readily as tinned steel, galvanized iron, copper, brass, etc. It gives off no toxic fumes, has no electrical conductivity and is especially effective when used for sweating copper fittings.

Farrelloy Co., 1231 N. 26th St., Philadelphia 21, Pennsylvania.

Use postpaid card. Circle No. 47

AIRLINE COUPLERS WILL NOT PULL APART ACCIDENTALLY

A line of airline couplers feature check units and adapters which lock together with a snap and will not accidentally pull apart during moving.

Air flow through Hi-Flo couplers has been raised to 65 cu. ft. per minute at 100 psi inlet pressure. The couplers are interchangeable with similar types used in industry.

A. Schrader's Son, 470 Vanderbilt Ave., Brooklyn, N.Y.

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Southeastern Manufacturers' Agent

desires to represent producer of quality industrial fasteners on commission basis.

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ASSEMBLY & FASTENER ENGINEERING
WHEATON, ILLINOIS

assembly and fastener engineering

FEBRUARY, 1960

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assembly and fastener engineering

FEBRUARY, 1960

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USEFUL LITERATURE

To receive your copy of any literature reviewed here, use the postpaid card opposite this page.

SPRING LOCK WASHERS

Revised prices for spring lock washers are listed in separate file folders for jobbers and consumers. Punched sheets chart 2000 sizes, quantities, metals, weights. Features of the non-link lock washer are described. Positive Lock Washer Co., 187 Miller St., Newark 5, New Jersey.

Use postpaid card. Circle No. 55

SOLDERING GUIDE

"A Guide to Preform Soldering," discusses solder preforms and their use. Included is data on the range of preform shapes, the alloys from which they are made and their use in automated production processes. The eight-page guide also describes heating methods, flux selection, metal characteristics and alloy selection. It contains a detailed temperature conversion chart. Alloys Unlimited, Inc., 21-01 43rd Ave., Long Island City 1, N.Y.

Use postpaid card. Circle No. 56

NEW FASTENER FACILITIES

Production facilities and products of a newly-organized Engineered Fasteners Division are illustrated in a 12-page brochure. The line of fasteners and special cold headed parts include lockbolts, blind rivets, installation tools, Tuff Tite fasteners and accessories, tubular rivets, clevis pins and solid rivets. Engineered Fasteners Division, Townsend Co., Box 71-Z, Ellwood City, Pa.

Use postpaid card. Circle No. 57

HEX HEAD CAP SCREWS

"Alloy Hex Head Cap Screws for Aircraft and Missiles," describes specialized inventory of grade 8 alloy steel fasteners. Conforming to six specifications, MS 35301 through MS 35306, all items described are carried in stock. A quick-reference chart of AN, MS and NAS fasteners is included in the four-page bulletin. Company letterhead. Hardware Specialty Company, Inc., 479 Washington St., New York 13, N.Y.

Use postpaid card. Circle No. 58

USING WIRE AND STRIP

Case studies of how design engineers were able to cut costs and improve the quality and sales appeal of their products, through the use of wire and strip metal components, are featured in a 22-page handbook. The handbook also describes the major types of wire available for component construction, the most popular finishes, wire sizes and the variety of end treatments, threading and forming possible. E. H. Titchener & Co., 57 Clinton St., Binghamton, N.Y.

Use postpaid card. Circle No. 59

SCREW MACHINE MANUAL

"Screw Machine Stock: Estimating and Operating Data," details properties, specifications, estimating information and shop practices for machining aluminum. The 120-page manual has an oil-resistant cover, section tabs, loose-leaf pages. Aluminum Company of America, 1501 Alcoa Bldg., Pittsburgh 19, Pennsylvania.

Use postpaid card. Circle No. 60

WELDING CASE HISTORIES

"How to Spot Weld Magnesium" is the technical feature article among a half dozen case histories of resistance welding at work. Seam welding in aviation, spot welding in electronics are also featured in the 16-page house organ. Sciaky Bros., Inc., 4915 W. 67th St., Chicago 38, Illinois.

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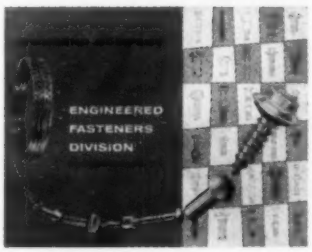
SHOCK ABSORBING RIVETER

Four models of a new lightweight riveter are pictured and specified in six-page Folder 5259. The unit's rubber-bonded nozzle eliminates piston shock. Features are pointed out on a cross-sec-



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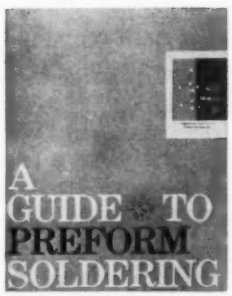

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tional drawing. Ingersoll-Rand, 11 Broadway, New York 4, N.Y.

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HIGH-TEMP FASTENERS

Engineering data on bolts, nuts, screws, dowels for high temperature use is presented in 12-page Catalog 286. The parts are fabricated to AMS 5735 for 1300° to 1800° applications. Mercury Air Parts Co., Inc., 9310 W. Jefferson Blvd., Culver City, Calif.

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AIRCRAFT BOLTS

Performance data in four-page Form 2527 on a line of aircraft bolts includes graphs charting tensile and fatigue strengths of comparable bolts. EWB 26 bolts are rated from 260,000 to 290,000 psi. Specifications are included. Standard Pressed Steel, Jenkintown, Pa.

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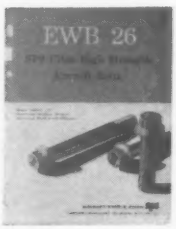

HAND TOOLS

A 16-page catalog pictures and specifies industrial hand tools. Pliers, leather-working tools, punches, blank tools and frames for special problems and miscellaneous hardware. Sargent and Co., 45 Water St., New Haven 9, Connecticut.

Use postpaid card. Circle No. 65

ALUMINUM FOR JOINING

Where and how to use aluminum for welding, brazing and soldering is the practical subject of a series of useful charts. Psi tensile strength, recommended joining material, per cent elongation and typical uses are shown for 24 aluminum alloys. All-State Welding Alloys Co., White Plains, N.Y.

Use postpaid card. Circle No. 66

WASHERS

A line of washers is described in a new brochure. Measurements, weights, sizes of flat steel washers, brass and finishing washers, split lock-washers and Shakeproof lock-washers are included. Accurate Threaded Fasteners, Inc., 2901 W. Montrose Ave., Chicago 18, Illinois.

Use postpaid card. Circle No. 67

POUCH PACKAGING UNIT

An automatic, pouch packaging machine which seals thin, irregular shaped articles between two continuous strips of packaging material is introduced in a two-page flyer. Flexopaker is described, specified, pictured. Battle Creek Packaging Machines, Inc., Merrill Park, Battle Creek, Michigan.

Use postpaid card. Circle No. 68

SOLDERS, FLUXES

Catalog C-1 presents stocked soldering supplies and includes suggestions on soldering stainless steel and other metals. The 12-page form illustrates and describes each available item. Johnson Mfg. Co., Inc., Mt. Vernon, Iowa.

Use postpaid card. Circle No. 69

LOW VISCOSITY ADHESIVES

Tensile and shear strengths of the Resiweld line of liquid, low viscosity adhesives are featured in a four-page bulletin. Uses of the epoxy adhesives are described. Plastic alloys, sealants and protective coatings also presented. H. B. Fuller Co., 255 Eagle St., St. Paul 2, Minnesota.

Use postpaid card. Circle No. 70

NYLON FASTENERS

A four-page bulletin catalogs stock nylon fasteners: washers, nuts, machine screws, set screws, insulators. Specifications and prices are listed. Richco Plastic Co., 4445 W. Fullerton Ave., Chicago 39, Illinois.

Use postpaid card. Circle No. 71

HOSE CLAMPS

Engineering Folder No. 1 pictures one-piece hose clamps in six typical applications. Installation sequence is shown and production features described. Specifications of the Hoz-Fas-Ners are listed. Eaton Mfg. Co., Reliance Div., Massillon, Ohio.

Use postpaid card. Circle No. 72

ELECTRONIC ALLOYS

A 40-page guide for buyers of specialty steels graphs and charts information on many types of alloys and steels. The section on electronic alloys contains graphs which compare expansion characteristics, electrical resistance, permeability, and magnetic flux density of various metals for electrical, magnetic and electronic applications. The Carpenter Steel Company, 314 West Bern Street, Reading, Pennsylvania.

Use postpaid card. Circle No. 73

INDUSTRIAL FURNACES

Furnaces for most applications—including brazing, heat treating, carburizing—are pictured in plant settings in Bulletin 9494. Handy chart shows heat treating process and applicable furnace and protective atmosphere types. Sunbeam Equipment Corp., 180 Mercer St., Meadville, Pennsylvania.

Use postpaid card. Circle No. 74

FIVE FASTENER TYPES

Five types of fasteners capable of covering many industrial needs are pictured and described in a four-page mailing piece: flat springs, sealing nuts, screw machine parts, retaining rings and hour glass shaped wire forms. Stanley-Humason, Inc., 33 Stafford Ave., Forestville, Connecticut.

Use postpaid card. Circle No. 75

QUICK RELEASE CLAMP

With engineering drawings and other illustrations, bulletin 209G describes the Flip-Loc hinged line fastener for rapid connect and disconnect. Fabricators who

work with electrical, hydraulic, or pneumatic lines of ¼" to 6" will be interested in the clamp's time-saving features as well as its ability to be opened and closed indefinitely without stress or distortion. TA Mfg. Corp., 4607 Alger St., Los Angeles 39, Calif.

Use postpaid card. Circle No. 76

SELF-SEALING FASTENERS

A line of high-pressure, vibration-resistant seals and fasteners are presented in 16-page indexed Catalog 359A. Tabular data, military and commercial specs, text and drawings are provided for toggle-switch boots, push-button switch boots and rotary seal shafts; sealing rivets, screws, bolts. A.P.M. Corp., 252 Hawthorne Ave., Yonkers, New York.

Use postpaid card. Circle No. 77

FASTENING IDEAS

How specially designed, stock fasteners can cut labor costs on the assembly line is analyzed in dollars-and-cents in six-page Bulletin 200. Twelve heavy-duty applications for pre-assembled screws, nuts and washers, thread-cutting screws, terminals, lockwashers are pictured and described. Shakeproof, Div. of Illinois Tool Works, St. Charles Rd., Elgin, Ill.

Use postpaid card. Circle No. 78

SEALING FASTENERS

Tuff Tite screws in many head styles are assembled with a tough neoprene washer to seal out fluid or gas. The fastener is shown in use and its features presented in a four-page brochure. Pheoll Mfg. Co., Inc., 5700 Roosevelt Rd., Chicago 50, Ill.

Use postpaid card. Circle No. 79

HOSE CLAMPS

Self-tightening hose clamps designed with the assembly line in mind are discussed in illustrated six-page Brochure HC18. Perfect circle ranges for all clamp sizes are charted. Installation, finishes, features presented. Corbin Hose Clamp Div., The American Hardware Corp., New Britain, Connecticut.

Use postpaid card. Circle No. 80

STANDARD SCREWS

Standard screws of all types are illustrated, specified and priced in 28-page Catalog 758. Recommended use for machine, welding, sheet metal, thread cutting, drive, clutch head, locking screws and Sems is given. Specials are available. Great Lakes Screw Corp., 13631 S. Halsted St., Chicago 27, Ill.

Use postpaid card. Circle No. 81

BLIND RIVET

A 16-page brochure (Form 8-388) describes the Conical Keystone Lock (CKL) blind rivet for structural fastening. Revised to include the latest in strength and material specification data, the catalog outlines features and presents photos illustrating typical applications. Drawings explain the driving cycle. Dimensional data includes both standard and 1/64" oversize diameter blind rivets. Huck Mfg. Co., 2480 Bellevue Ave., Detroit 7, Mich.

Use postpaid card. Circle No. 82

ADHESIVE DISPENSERS

Two bulletins detail automatic adhesive dispensing equipment. Features of the Meter-Mixer for two-part compounds and adhesives the 1600 Series for continuous operation with viscous compounds are described. The equipment also meters, mixes, pumps and applies sealer, coating, paint, epoxies and catalyzed materials. Pyles Industries, Inc., 20855 Telegraph Rd., Detroit 41, Michigan.

Use postpaid card. Circle No. 83

WASHERS

Price lists for 1960 for spring lock washers and flat washers are available in self binders. American Nut & Bolt Fastener Co., 14 Wood St., Pittsburgh 22, Pennsylvania.

Use postpaid card. Circle No. 84

RIVETING ALUMINUM

How can the shear strength of a driven aluminum rivet be determined? What is the best hole size for a hot-driven aluminum alloy rivet? A 52-page booklet, "Riveting Aluminum," covers use of conventional and special rivets, and explains design and fabrication of riveted joints. Tables in the book list weights and dimensions of aluminum rivets, recommended rivet lengths, mechanical properties of wrought aluminum alloys, and other data. Letter head request. Reynolds Metals Co., Dept. AFE-23, Richmond 18, Va.

INTERFERENCE-FIT THREADS

"Trial American Standard Class 5 Interference-Fit threads, B1.12" provides dimensional tables external and internal interference-fit (Class 5) threads of modified American National form in the coarse thread series from ¼" to 1½" in diameter. Basic principles and applications are described, including lubrication, condition of holes, materials, angles, driving speed. $1. The American Society of Mechanical Engineers, 29 W. 39th St., New York 18, New York.

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BECAUSE... whatever the size or shape of the workpiece you wish to hold—wherever you have to push, pull or lock with forces from 50 to 10,000 pounds—it's a hundred-to-one there's a DE-STA-CO Toggle Clamp to fit the job! And if not, our engineering staff will show you how easily one may be adapted!... 13 basic styles and over 140 models! Photo shows typical size range. . . . Complete template sets available.

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3661 N.W. 48 St. Miami, Florida	250 Mill St. Waterbury, Conn.

Use postpaid card. Circle No. 273

WIRE SOLDER DISPENSER

Speeding assembly line soldering is the job of a wire solder dispenser tool described in a single-page flyer. The Kormat tool is shown in use and its features pointed out. It holds enough solder for an average shift and is engineered for a variety of hand grip positions. International Electronic Research Corp., 145 W. Magnolia Blvd., Burbank, California.

Use postpaid card. Circle No. 85

QUICK RELEASE FASTENER

Step-by-step action of a three-piece quick release fastener is pointed out in a four-page brochure. The fastener eliminates the need of "backing off" or resetting a locking device due to spring back or warp in panels. Specifications are given. Calinoy, Div. of Illinois Tool Works, 3155 El Segundo Ave., Hawthorne, California.

Use postpaid card. Circle No. 86

WELDING FOR ELECTRONICS

A 4-page, short-form catalog illustrates a newly-completed line of precision electronic welding equipment. It contains descriptions, design and performance features, prices, and illustrations of all stored-energy power supplies, column-mounted welding heads, and light-to-heavy-duty handpieces. Several typical set-ups are shown. Weldmatic Div., Unitek Corp., 380 N. Halstead Ave., Pasadena, Calif.

Use postpaid card. Circle No. 87

INDUCTION HEATING TIPS

Recent developments in hardening, brazing, soldering, forging and annealing with induction heating equipment has been incorporated into a 52-page catalog-handbook. "How it's done" photos, case histories, and cataloging data on equipment are included. Sections are on electronic generator features, motor generator sets, low frequency heating units. Induction Heating Corp., 181 Wythe Ave., Brooklyn 11, New York.

Use postpaid card. Circle No. 88

WELDING ELECTRODE GUIDE

New products and new engineering data have been added to the most recent edition of "Electrode Pocket Guide." The 64-page booklet, ADC 650, contains complete information on all types of electrodes available from Airco: mild steel, low alloy, low hydrogen, iron powder, stainless steel, hardfacing, non-ferrous and cast iron. Two eight-page foldouts at the rear of the book contain charts of recommended electrodes for welding A.S.T.M. and trade name steels, and comparison tables for mild steel and hardfacing electrodes of leading manufacturers. Air Reduction Sales Co., 150 East 42nd St., New York 17, New York.

Use postpaid card. Circle No. 89

PANEL CLAMP

A data sheet describes the Clamp-Lock, a compactly designed, high-strength clamping device for quick and easy assembly (and disassembly) of rooms and buildings of flanged-panel construction. Simmons Fastener Corp., North Broadway, Albany 1, N.Y.

Use postpaid card. Circle No. 90

THREADED INSERT

A bulletin describes the advantages of a self-locking, threaded insert and gives detail drawings of the fastener in application. E-z-lock inserts require only standard course-thread taps and standard driver for installation. Sizes and specifications given. Tool Components, Inc., 12923 Budlong Ave., Gardena, California.

Use postpaid card. Circle No. 91

SELF-LOCKING NUTS

A 24-page, illustrated brochure describes self-locking nuts for ground and airborne weapons systems. Included in the booklet are the most popular styles and sizes of lightweight, low height, self-locking, all-metal nuts; the NAS series; self-sealing types; and the Timesaver line of replaceable floating nuts. Nutt-Shel Co., 2701 South Harbor Blvd., Santa Ana, California.

Use postpaid card. Circle No. 92

PLASTIC PARTS

Advantages, uses and limitations of parts fabricated from nylon, Delrin or Penton (chlorinated polyether resin) are listed in four-page Bulletin 659. Included is a tabular comparison of the materials' mechanical, electrical, thermal properties. Stocks sizes of extrusions in rod, tubing and strip form are listed. National Vulcanized Fibre Co., 1059 Beech St., Wilmington 99, Del.

Use postpaid card. Circle No. 93

DRILL UNIT TIMER

The Model 502 Beco drill unit timer is a cabinet with relay chassis. It accommodates either a broken tool detector or an attachment for interrupting the forward spindle travel to break chips during deep hole drilling. A two-page, punched flyer features photos and description of the unit. Batchelder Engineering Co., Springfield, Vt.

Use postpaid card. Circle No. 94

NUTPLATE DRILL

The Nutplate Drillmotor accurately drills and countersinks two holes in two seconds. The tool and various nutplate models are specified and illustrated. Winslow Product Engineering Corp., 47 St. Joseph St., Arcadia, Calif.

Use postpaid card. Circle No. 95

EYELETTING APPLICATION

Industrial eyelets and eyeletting machines are completely covered in a handsome 48-page, three-color catalog. Eyelets, classified both by type and using industry, are pictured and specified. Application tips are included. Each model machine is pictured and described. Letterhead inquiry requested. Eyelet Dept., United Shoe Machinery Corp., 140 Federal St., Boston 7, Mass.

Use postpaid card. Circle No. 96

NON-METALLIC-CLAMPS

A series of flyers describe cable clamps of black nylon, ethyl cellulose, teflon, and washers for use with plastic clamps. Properties, chemical resistance, specifications and drawings are included. Weckesser Co., 5701 Northwest Hwy., Chicago 30, Ill.

Use postpaid card. Circle No. 97

SILVER BRAZING EXPLAINED

Designing joints for silver brazing, how to select proper alloys and methods of application highlight 26-page Bulletin 20. Six types of low temperature alloys are introduced with their uses and features. Profusely illustrated, helpful reference. Handy & Harman, 82 Fulton St., New York 38, N. Y.

Use postpaid card. Circle No. 98

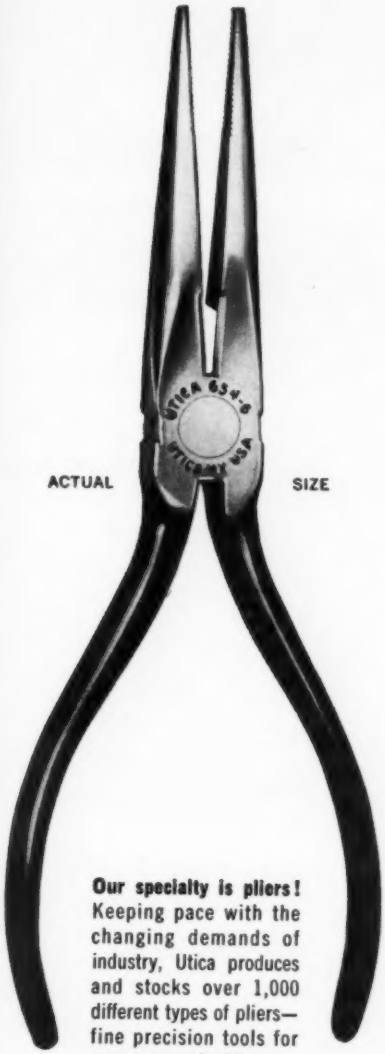
JOINING ALUMINUM PARTS

What are the best ways to mechanically join aluminum parts? This question and others about mechanical fastening methods for aluminum are answered in a new technical handbook, "Mechanical Joining of Aluminum." The illustrated 32-page book covers nails and pins, metal stitching, mechanically formed joints and architectural fasteners. Letterhead requested. Reynolds Metals Company, Dept. PRD-28-AFE, Richmond 18, Virginia

RESISTANCE WELDING FILMS

A 20-minute, 16 mm., sound, color movie called "This is Resistance Welding" describes the basic fundamentals of the process. A 23-minute sequel film deals with capacities and applications of the machinery. A third film, "Resistance Welding of Stainless Steel," covers spot, seam, projection and flash welding. Direct requests for borrowing without charge to the Resistance Welder Manufacturers' Assoc., 1900 Arch St., Philadelphia 3, Pa.

UTICA



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Our specialty is pliers! Keeping pace with the changing demands of industry, Utica produces and stocks over 1,000 different types of pliers—fine precision tools for every conceivable use. Because of the job we have been able to do in many of the country's largest and most specialized plants, we believe that Utica tools can help you, too—either reduce your costs or improve your products. Contact your Utica distributor, today.

Utica Drop Forge & Tool Division, Kelsey-Hayes Company, Utica 4, N. Y.

tools the experts use!

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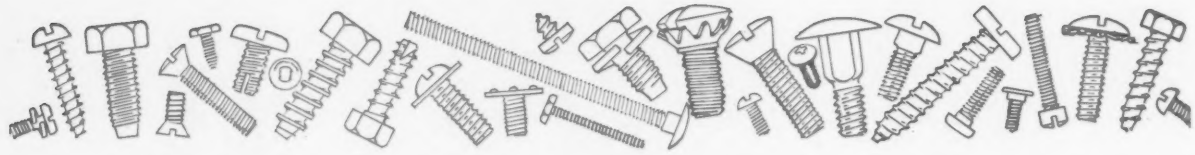
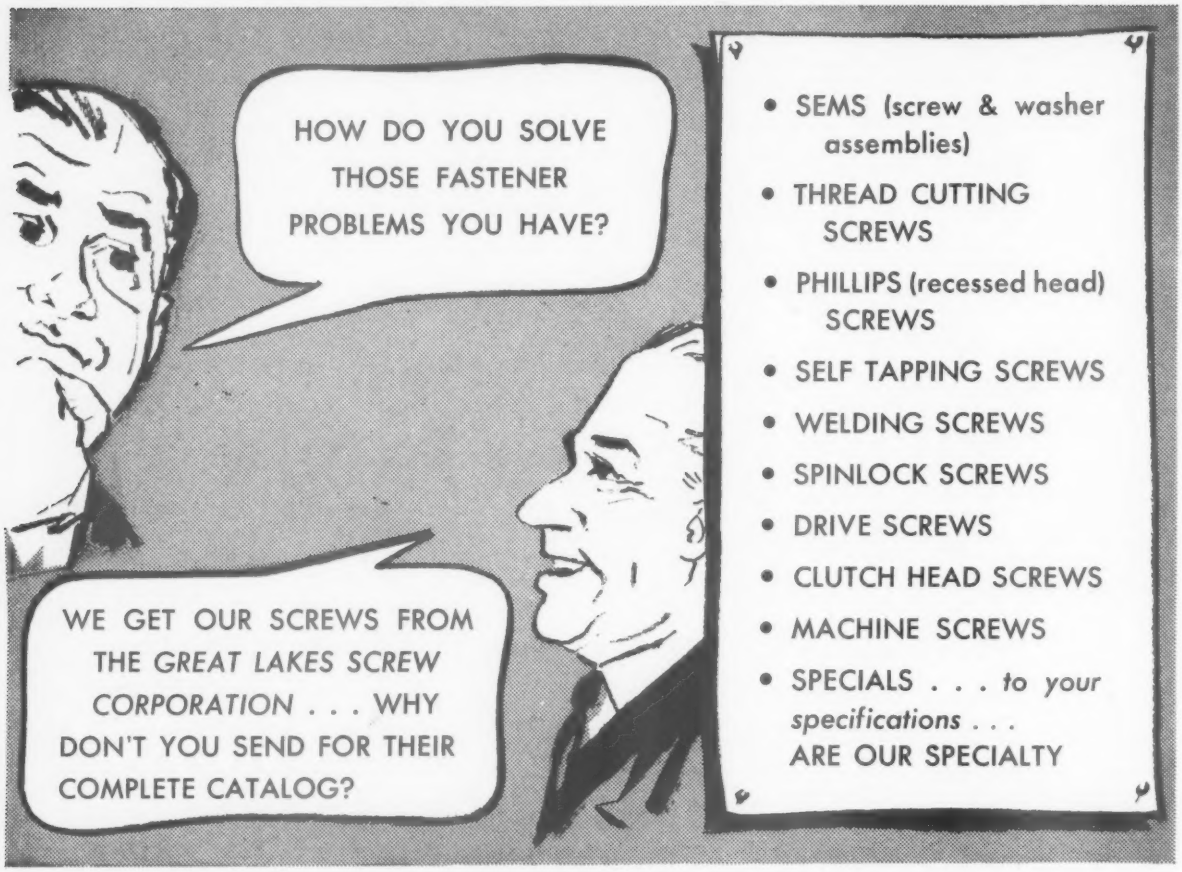


SCREWS of all TYPES
from one reliable source


HOW DO YOU SOLVE THOSE FASTENER PROBLEMS YOU HAVE?
WE GET OUR SCREWS FROM THE GREAT LAKES SCREW CORPORATION . . . WHY DON'T YOU SEND FOR THEIR COMPLETE CATALOG?
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That's sound advice! That's what hundreds of manufacturers have found . . . a reliable, competent and friendly source of supply, interested in their customers' fastening problems. The first step for you is to send for their complete catalog and price list filled with data on sizes, types, materials and specific recommendations. An excellent purchasing tool, the catalog is also a means of your getting acquainted with a screw manufacturer who is centrally located and with a reputation for service and quality. Write for your free copy of the catalog today.

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CHICAGO 27, ILLINOIS

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INDUSTRY MAKES NEWS

Heli-Coil president Eduard Baruch (left) and Grip-Nut officers Chester Tripp and Richard Swanson close agreement whereby Heli-Coil acquired Grip-Nut.

HELI-COIL ACQUIRES GRIP-NUT COMPANY

The Heli-Coil Corp., Danbury, Conn. manufacturers of wire thread inserts, closed the acquisition of the Grip-Nut Co., South Whitley, Ind., on Dec. 22, announced Heli-Coil president, Edward Baruch.

At the same time, Chester D. Tripp and Richard R. Swanson were appointed to the Heli-Coil board of directors. Tripp is chairman of the Grip-Nut board and Swanson is executive vice president.

FASTENER SHIPMENTS DROP IN NOVEMBER

November shipments of industrial fasteners declined five percentage points (seasonally adjusted) from the already-low level of October, reported the Industrial Fasteners Institute in its monthly index of shipments.

The November figure of 115 (based on the 1947-49 average of 100) was about one-third below the average of shipments for the first six months of 1959. This continues to reflect the disruption of production of both fastener users and manufacturers caused by the steel strike.

The adjusted yearly average for 1956 was 160; for 1957, 162; for 1958, 125. The breakdown by month in 1959 is, in sequence, 140, 153, 152, 175, 175, 187, 165, 111, 119, 120 and 115.

H. K. PORTER BUILDS POWER TOOL PLANT

H. K. Porter Co., Inc., Pittsburgh, Pa., is producing portable electric power tools in a new 163,000 sq. ft. plant in Danville, Virginia. The facility was built for the Disston Division.

According to Jules Hydrick, vice president and Disston Division general manager, completely new metallurgical and chemical laboratories have been installed to facilitate testing and research activities.

Construction was begun February 1959 and

continued

Power tool assembly and testing lines are arranged for most efficient operation at H. K. Porter's new Danville, Va., plant.

The first circular saw off the Danville assembly line is presented to M. C. Shevchik, works manager, by Jack Butler, power tool foreman. Arthur Kraft (left), senior foreman, and Elwood Dorman, production superintendent, look on.

the first shipment of machine tools from the Disston Works in Philadelphia was made in August. The plant employs 250.

RCI EXPANDS ALABAMA PHENOL PLANT

Reichhold Chemicals, Inc. is spending approximately $2,500,000 to enlarge its phenol plant in Tuscaloosa, Alabama.

The enlarged facility, now under construction, will increase RCI's phenol production there from its current 60,000,000 pounds a year level to 90,000,000 pounds.

ACME STAMPING CHANGES CORPORATE NAME

Effective January 2, the corporate name of the Acme Stamping & Manufacturing Company, Pittsburgh, was changed to Acme Stamping & Wire Forming Company, to better denote the company's expanding operations in the metal-working field. The corporate structure, management and operating policy of the organization remained intact.

NOMA LITES TO ACQUIRE AMERICAN SCREW

Under the provisions of an agreement between company directors, Noma Lites, Inc., New York, will acquire substantially all the assets of American Screw Co., Willimantic, Conn. Present management will remain the same.

The proposal calls for issuance of seven Noma common shares for each outstanding share of American Screw. Noma will assume the liabilities of American Screw. The proposal will be submitted to holders of American Screw at a later meeting.

Noma, a manufacturer of Christmas lights, already owns 59.98% of American's shares through a wholly-owned subsidiary, Noma Lights Canada, Ltd.

ALPHA METALS HEAD DIES IN PLANE CRASH

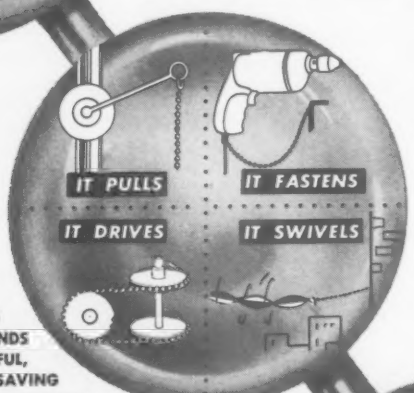
Harold M. Shonberg, president of Alpha Metals, Inc., Jersey City, N.J., and the Alpha-loy Corp., Chicago, Ill., was one of five people killed December 5, at Palm Desert, Calif., when the small plane in which he was being given a demonstration flight, so that he might consider purchasing it for his company, collided in the air with another private plane. He was 49.

Mr. Shonberg started his firm in 1930. He had previously taken over I. Shonberg, Inc., a company founded by his grandfather in 1871 as a metal refinery then reorganized by his father, in 1912, as Standard Rolling Mills, Inc.

AMERICAN RIVET PROMOTES BUCK

The American Rivet Co., Inc., Chicago announces that Richard G. Buck has been made a vice-president. Buck is responsible for sales in several eastern and midwestern states, and will make his headquarters in Logansport, Indiana.

take advantage of *Versatile* BEAD CHAIN



IT HAS THOUSANDS OF USEFUL, COST-SAVING APPLICATIONS!

Bead Chain is available in 5 diameters from 3/32" to ¾" with tensile strengths ranging from 18 to 200 lbs., in a variety of metals and finishes. No matter what the requirement, our engineers will be glad to assist you in solving your chain applications.

For complete information send for FREE HELPFUL CATALOG

THE BEAD CHAIN MANUFACTURING CO.
208 MOUNTAIN GROVE ST., BRIDGEPORT, CONN.

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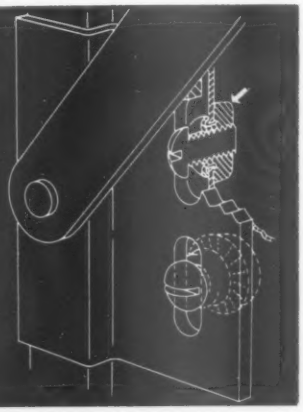
MACHINE-SET FASTENER DOUBLES AS NUT PLATE AND ADJUSTMENT SPACER



The new TRS Perma-Nut® solved a tough production problem for a large manufacturer of jalousie-type aluminum windows. It's an internally-threaded tubular rivet, fed and set by standard automatic riveters. Two Perma-Nuts in each actuating-lever pivot bracket . . . a total of 8 for a standard two-light jalousie . . . provide permanent threaded fittings for the bracket tightening screws, which pass through slotted openings for bracket position adjustment. Strong threads in the Perma-Nut head hold the screw tight, and sharp serrations under the head provide a built-in lockwasher. Perma-Nuts are available in 9 thread sizes from #3-48 to ¼-28, in steel, brass or aluminum. WRITE FOR FREE FACT-FILLED PERMA-NUT BULLETIN.

TRS TUBULAR RIVET & STUD CO.
Quincy 70, Massachusetts

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ILLINOIS TOOL, FASTEX PROMOTE THREE

CATHCART

SMITH

NORMAN

Illinois Tool Works, Chicago, announces three executive promotions. Silas S. Cathcart was elected vice president for corporate planning, serving also as administrative assistant to the executive vice president. James D. Norman was named general manager of Fastex Division, DesPlaines, succeeding Cathcart. Harold B. Smith, Jr., succeeds Norman as sales manager of Fastex. He was formerly engaged in engineering and product development.

NEW JERSEY WELDERS SPONSOR SEMINAR

The American Welding Society, New Jersey Section, will hold a two-day Welding Educational Seminar on March 16th and 17th, 1960 at the Essex House in Newark.

Hundreds of welders, technicians, supervisors, and engineers from the New Jersey, New York, Long Island, and Philadelphia areas will hear some of the top welding authorities in the country discuss welding techniques and joining methods, including helpful suggestions on how to solve difficult welding problems.

In addition to the technical sessions, there will be field trips to welding research laboratories and fabricators in the Newark area.

Registration fee of $20.00 covers the plant tours and lunch

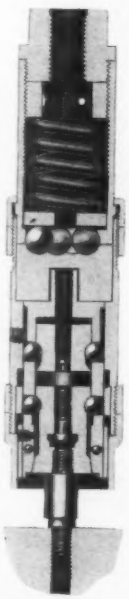
continued

NEW

Controlled (Torque) Drive

STUD DRIVER

. . . for Stud Driving applications requiring limited torque while driving the stud



A necessity where a limited amount of torque is desired—as in driving shoulder studs.

As shown in the sectional view, this new tool has an adjustable over-running clutch so that the stud can be driven to any predetermined torque. Simple adjustment is made by removing the two Allen screws in the spring adjusting nut (directly above spring) and moving it downward for increased torque, or upward for decreased torque. It is not necessary to stop rotation at any time while driving studs. Other outstanding Titan Stud Driver features are an automatic take-up for jaw wear, and an inexpensive method of changing the cam ring.

While not designed for use with impact wrenches it is an ideal tool for use with any air or electric drill or drill press at constant speed. Available in sizes No. 101, No. 102 and No. 103.

Write for details and prices

TITAN TOOLS — World's Largest Producers Of Stud Drivers And Pullers

TITAN TOOL CO.

47 MAIN ST., FAIRVIEW (ERIE COUNTY), PA.

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brazing washers

Edgewound

FROM WIRE STOCK

No die charges
No blanking scrap losses

- No lead time needed for dies or exact strip.
- Use with induction, gas-air, furnace, or other heating methods.
- Available in EASY FLO and SILFOS — Copper, Bronze, and other alloys.
- Diameters up to 4" I.D., wire thicknesses from .010 upward.

Write for 16 page booklet on better brazing.

LUCAS-MILHAUPT *Engineering Co.*

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Looking for something special . . . for a particular application?

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SERVICE—QUALITY—UNIFORMITY

OHIO ROD makes Special Headed and/or Threaded Fasteners in short and long length – in short or long runs. Headed, Threaded, Collared, Bent, or Offset.

Send drawings or blueprints for quotes and literature.

OHIO ROD PRODUCTS CO., INC.

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and dinner for the two days; an optional registration fee of $10.00 includes the plant tour but no meals. Tickets can be secured by mailing your check to American Welding Society, c/o C. J. Sullivan; P.O. Box 2; Union, New Jersey.

DESIGN ENGINEERING SHOW TO NEW YORK

The Design Engineering Show, an exposition devoted to the research and development of new products, will occupy all four floors of the New York Coliseum during a four-day run, May 23 to 26. Three hundred and seventy-five companies already have contracted for exhibit space.

During the same four days, the machine design division of the American Society of Mechanical Engineers will sponsor its annual Design Engineering Conference also at the Coliseum. The twin events were last held in New York in 1957.

ASSOCIATED SPRING LICENSES FOREIGN FIRM

Technical assistance in the manufacture of mechanical springs will be furnished by Associated Spring Corp., Bristol, Conn., under the terms of a five-year licensing agreement. The Argentine company, Resortes Argentina S.A., is a newly formed venture in Cordoba, a city of 400,000 located 400 miles northwest of Buenos Aires.

SPARKLIN, WHIRLPOOL ENGINEER, RETIRES

Charles H. Sparklin, Whirlpool Corp. director of engineering (special products) and former vice president of the Birtman Electric Co., retired on Dec. 31. A holder of more than 50 patents in the field of appliances, Sparklin will engage in private practice as an engineering consultant in St. Joseph, Mich.

FASTENING ALERTNESS REWARDED—James H. Fortune, 29, a working foreman in the Maytag Company's Plant 2 paint department receives $1,723.95 for three ideas under the firm's work simplification program. His suggestions eliminated temporary braces used on the backs of appliance cabinets, changed the method of shipping angle brackets from the paint department to dryer assembly.

MASTER POWER NAMES ENGINEERING MGR.

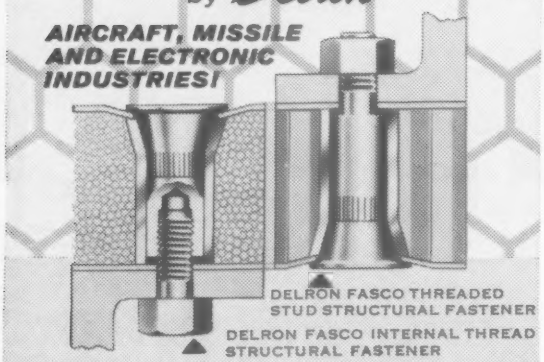
William S. Brucker has been appointed engineering manager of the Master Power Corp. of Bedford, Ohio, a subsidiary of The Black & Decker Mfg. Co. Brucker will be responsible for directing the engineering research and development functions of the air tool line.

Brucker comes from Black & Decker, where he started in 1947 as assistant mechanical engineer. His most recent position was chief development engineer.

WELDING FIRM NAMES CANADIAN REP.

Upton Bradeen & James Ltd., Toronto, Ont., has been named exclusive Canadian sales representatives for National Electric Welding Machines Co., Bay City, Mich.

HONEYCOMB
and sandwich panel
FASCO
FASTENERS
PATENT PENDING
by Delron
AIRCRAFT, MISSILE AND ELECTRONIC INDUSTRIES!



Illustrated above are two of the many new Delron structural design fasteners now available for Honeycomb and Sandwich Panels.
• Write for engineering data.

... Largest manufacturer of specialized Sandwich Panel Fasteners.

THE DELRON COMPANY, INC.
5224 Southern Avenue, South Gate, California
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Available in Stainless Steel, Silicon Bronze, Brass, Aluminum and Steel

JACOBSON NUT MFG. CORP. Kenilworth, New Jersey

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STANLEY-HUMASON ELECTS WHITNEY PRES.

Larned S. Whitney, Jr., has been elected president and a director of Stanley-Humason, Inc. of Forestville, Conn., a subsidiary of The Stanley Works, New Britain, at a meeting of the board of directors. He has been vice president and general manager of the subsidiary since May, 1959.

Previously, Whitney was coordinator of hand tool plants outside New Britain, including the Atha plant of Newark, New Jersey, Stanley, Inc., of Pulaski, Tenn., and The Stanley Tool Company of Canada, Ltd., of which he is also a director. He joined Stanley Tools in 1946 and became a methods engineer. Later he managed the Ashfield plant, Ashfield, Mass. and in 1948 was made assistant divisional superintendent of Stanley Tools in New Britain.

JOY NAMED V-P SALES AT J. L. THOMSON

President Ralph S. Battles of Judson L. Thomson Mfg. Co. announced that the board of directors has established the position of vice president in charge of sales, appointing Kenneth E. Joy as an officer of the company to fill the new position.

Joy joined Thomson as general sales manager in January 1958 and was previously in charge of sales for Bostitch.

ROYAL INDUSTRIES NAMES ASSEMBLY SUPT.

Royal Industries, Inc., Beverly Hills, Calif., has announced the appointment of Harry Houdyshell as chief engineer and Dean Oleson as assembly superintendent of the company's Pacific Electronic Controls Division, Monrovia, Calif.

Houdyshell is former chief product engineer of the Helipot Division of Beckman Instruments, Inc. Oleson, before coming to Royal, was factory supervisor of the Poco Tiempo Department of Helipot.

continued

ELIMINATE BUGABOOS OF CORROSION AND MAGNETISM WITH KNU-VISE STAINLESS STEEL CLAMPS

All shown ¼ actual size

Knu-Vise stainless steel toggle clamps eliminate frustrating magnetic attraction and corrosion while spot welding, or while working near acids.

The complete stainless steel line contains 18 clamps with either horizontal, vertical, or T-style handles. There are types for side mounting and pull clamps as well. Write today for complete information. A standard or a special Knu-Vise clamp will probably be the answer to your application.

Manufacturers of over 150 models of manually and air-operated clamps and pliers

KNU-VISE PRODUCTS — LAPEER MANUFACTURING CO.

3070 DAVISON ROAD
LAPEER, MICHIGAN

WESTERN DIV.: PECK and LEWIS CORPORATION
4436 Long Beach Ave., Los Angeles 58, Calif., ADams 3-7146
CANADIAN DIV.: HIGGINSON EQUIP. SALES LTD.
1131 Pettit Road, Burlington, Ontario

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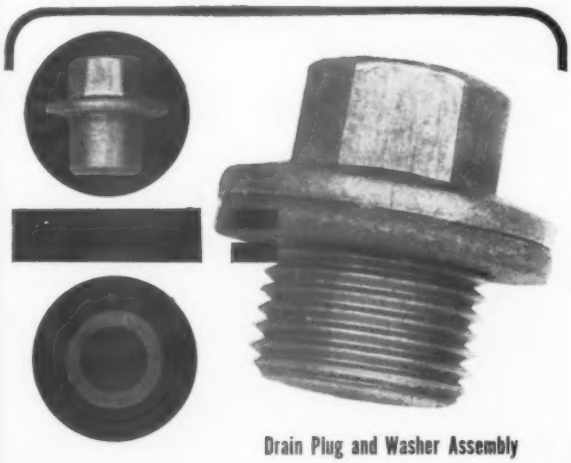

Drain Plug and Washer Assembly

DIVIDE COSTS ----

Specify assembled parts for savings in setup, tooling and floor space. Forged steel filler and drain plugs from Pittsburgh are engineered for this purpose —washer and plug now an integrated unit. Write for additional information.

Pittsburgh Plug and Products Corporation
P. O. Box 304 Evans City, Pa.

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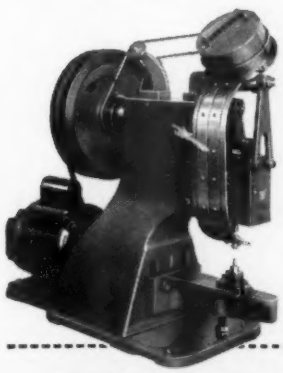
look into eyelets your FASTENING to solve PROBLEM

Edward Segal

AUTOMATIC EYELETING MACHINERY

single & multiple settings for product improvement and continuing savings



Manufacturers who introduce precision built Edward Segal eyeleting machines to their fastening jobs find they require less handling and production time over other methods—and the machines are complete with no adaptation necessary. Eyelets usually cost much less, and the fastening looks far better.

Depending upon your operation, these highly reliable machines can be supplied with varying degrees of automation. Feeding is simplified, and because of the Limited Travel Spindle (pat. pend.), even settings as small as .032" I.D. are possible with a minimum of tool breakage.

Let Segal engineers study your fastening problem without obligation. Write for details to section AFE-2

EDWARD SEGAL • 132 LAFAYETTE STREET, NEW YORK 13, N. Y.
Manufacturers of eyeleting machinery, special hoppers and feeding devices

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PURCHASING AGT. JOINS STANDARD SHANNON

John H. Price, industrial distributor, has joined the staff of Standard-Shannon Supply Co., Philadelphia. Price brings to his new company 26 years of business experience, having started as a messenger boy with another Philadelphia distributor and advancing to the position of purchasing agent.

HUCK NAMES ASSISTANT SALES MANAGER

James A. D'Errico has been appointed assistant sales manager for Huck Manufacturing Company, Detroit, Mich.

D'Errico will have his offices at Huck's facility in suburban Los Angeles. He will direct sales engineering activities involving aircraft customers in the nine western states.

NAT'L LOCK TRANSFERS HEIMERT TO CALIF.

Glen M. Heimert has been assigned to the Los Angeles office of the National Lock Company, Rockford, as Industrial Division sales representative for Southern California. He succeeds E. C. Houston, retiring Jan. 31 after 35 years with the company.

HOUSTON

HEIMERT

Heimert, 39, has been with National Lock 12 years, most recently as Cabinet Hardware sales representative in the home office.

THOR MOVES NEW YORK SALES BRANCH

Thor Power Tool Company, Aurora, Ill., has moved its New York customer service branch and sales headquarters to a new building at 58-10 Broadway, Woodside, N.Y.

PROMOTIONS FOR TWO AT RCA

Two divisions of Radio Corporation of America have announced promotions. Loren F. Jones, in the company's electronics dept. since 1930, will be manager, product planning, of the Communications and Industrial Electronic Products Operations Division. Francis J. Dunleavy will be general manager of the Industrial and Automation Division. He was formerly general manager of the Materials Handling Division.

FISCHER MAKES SALES EXECUTIVE CHANGES

Fischer Special Mfg. Co., Cincinnati, has advanced Carl H. Gross to the newly established job of marketing manager and has promoted Robert L. Payne to sales manager.

GROSS

PAYNE

With 45 years of service at Fischer, Gross has served successively in costing, sales and managerial functions. He has been sales manager since 1930. Payne joined the firm as a sales representative in 1951 and was appointed assistant sales manager in 1953. He has worked for the Crosley Div. of Avco Corp. and Armour & Co.

PARKER-KALON ADDS FIELD ENGINEERS

Parker-Kalon, a division of General American Transportation Corp., Clifton, N.J. has named two new field engineers.

Richard B. Jamison will serve as fastener consultant to distributors and manufacturers in Missouri, Kansas, Iowa and eastern Nebraska. His headquarters will be St. Louis.

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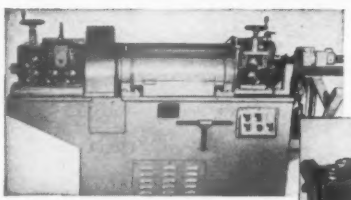

Roll type straighteners interchangeable with rotary arbor.

These new SHUSTER wire straightening and cutting machines incorporate new advantages to give you higher production — for less cost. The 2ABV variable speed unit straightens and cuts round wire from 3/16" to 3/8"; the 2ABVF straightens and cuts shape stock up to 1/4" square.

The new machines include an improved, vertical drive 5-roll gear driven preliminary straightening unit, and feed roll housing, both Timken bearing equipped. The new SHUSTERS can automatically cut lengths up to 14" at the rate of 140 pcs./min. and provide infinite variable speed within all feed and cutoff ranges. This machine may also be purchased as a constant speed unit (150 F.P.M.).

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The new Morris-Omega "00" SDDS Cold Header forms parts from wire down to .012" diameter in lengths as short as .016" — and at production rates as high as 150 per minute!

The Model "00" is only one of a series of precision heading machines, which includes a special open die type that will head parts up to 2⅜" in length on wire sizes from .020" to .090".

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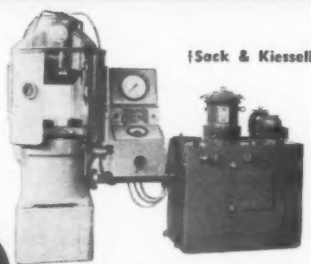

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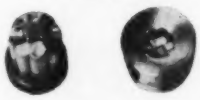

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CONTROL NON-PRODUCTIVE LABOR COSTS

You may remember an old cartoon showing a man shoveling snow off his sidewalk. He threw the snow over his shoulder and when he arrived at the end of the walk discovered that the snow he'd shoveled away in front had landed behind him and his walk was still knee-deep in snow. Industry could well be in danger of doing the same thing in the realm of productive and non-productive labor.

Automation, semi-automation and efficient utilization of improved methods have cut sharply into the productive labor force. Their number will decline in the years ahead. In contrast, the number of non-production workers has increased. Thus, while management has decreased its productive labor force costs, it has increased its non-productive labor costs. This was inevitable. If one would improve methods, reduce costs and analyze production problems—if one would substitute machines for muscles, one must have people to design, build and service them. And so, much of the snow from in front is now behind!

There appears to be an area here for cost reductions. At first blush it might seem cold-blooded and unkind to suggest that the same people who have been instrumental in reducing productive labor costs should be subjects of analysis. Yet, good business management makes such investigations and analyses mandatory. High rewards may be reaped by business in this area because so very little scientific investigation has been carried on by industry in this field. Non-productive activities have grown, in many instances, willy-nilly to a point where money saved by reducing productive labor time is being eaten up by the non-productive which first produced the savings.

There is no reason why the same reliable and proven measurements which have been applied so successfully to line cannot be adapted to staff functions. Analysis, measurement, standards, incentives and other tried techniques can be used with worthwhile results. To be sure, there will be areas where accepted techniques defy application; here new methods must be introduced and it could well be that an entirely new interpretation of a system may be developed. This would be a definite contribution to sound management practice which the engineering profession could make.

One must not be unmindful that giant-like strides have been made by the business machine manufacturers to automate office procedures; however, there remain many areas which do not lend themselves to mechanical operation and where any improvement, however small, will pay big dividends. Such improvements will primarily be in the realm of better utilization of the brains, imagination and abilities of people.

If we must shovel the sidewalk, let's not throw the snow behind us.

Wm. J. Schleicher

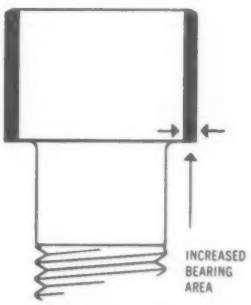
Vice President & Editorial Director

Up to 2⅓ times as much holding power!

Up to 100% longer fatigue life!

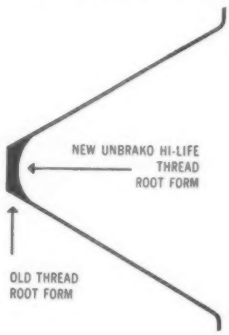
New UNBRAKO *pHd** Hi-Life socket screws —the advanced-design fastener for the 60's

Stronger in the head



New pHd head features increased bearing area, more powerful wrenching socket; provides up to 2⅓ times as much clamping force without indenting bolted material. This permits higher preloading, which in turn helps prevent fatigue failures or loosening under vibration.

Stronger in the thread



Smoothly radiused root of new Hi-Life thread distributes stress concentrations at point where 85% of screw failures occur. Elimination of sharp root corners practically doubles fatigue life, yet new thread fits standard tapped holes and nuts, requires no special gaging.

Here is the one new socket head cap screw that is redesigned *throughout*. UNBRAKO pHd Hi-Life is the only standard socket screw offering you both the new, larger pHd head (1960 Series) *and* new UNBRAKO Hi-Life thread—a combination unequaled for strength and performance.

Because of its increased bearing area under the head, you can tighten a pHd Hi-Life tighter without indenting the bolted material. This safeguards vital preload; protects against loosening under shock or vibration. At the same time, the new Hi-Life thread form drastically reduces stress concentrations at the root, where the majority of screw failures occur. Result: up to 100% increase in fatigue life.

Both the pHd head and Hi-Life thread originated in the SPS laboratories for advanced fastener research where they were first developed for ultra-high-strength aircraft bolts. Recognizing the critical need for increased mechanical reliability in industrial and consumer goods as well, SPS now offers these refinements in a standard commercial fastener. Price? The same as previous UNBRAKOs. Availability? Immediate—in sizes ¼ through 1 inch. See your authorized industrial distributor or write SPS—manufacturer of precision threaded fasteners and allied products in many metals, including titanium. Request Bulletins 2406, 2577.

TENSION-TENSION FATIGUE TESTS PROVE LONGER FATIGUE LIFE OF UNBRAKO HI-LIFE THREAD FORM

Screw Size: ½-20 Testing Speed: 1050 cpm

Alternating Stress in psi (000 omitted)	Cycle Life: Old Thread Root Form	Cycle Life: UNBRAKO Hi-Life Threads
2-20	2,076,000	8,000,000*
3-30	598,000	1,808,000
4-40	120,700	232,350
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*Test stopped—no failure

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